GE Medical Systems
Kretz Ultrasound

Technical Publication

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Revision 1

GE Medical Systems - Kretztechnik

Voluson® 730
Service Manual

CE 0366

Operating Documentation

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Important Precautions

- **THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.**
- **IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.**

WARNING

- **DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THIS SERVICE MANUAL HAS BEEN CONSULTED AND IS UNDERSTOOD.**
- **FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.**

- **CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.**
- **SI LE TECHNICIEN DU CLIENT A BESOIN DE CE MANUEL DANS UNE AUTRE LANGUE QUE L'ANGLAIS, C'EST AU CLIENT QU'IL INCOMBE DE LE FAIRE TRADUIRE.**

AVERTISSEMENT

- **NE PAS TENTER D'INTERVENTION SUR LES ÉQUIPEMENTS TANT QUE LE MANUEL SERVICE N'A PAS ÉTÉ CONSULTÉ ET COMPRIS.**
- **LE NON-RESPECT DE CET AVERTISSEMENT PEUT ENTRAÎNER CHEZ LE TECHNICIEN, L'OPÉRATEUR OU LE PATIENT DES BLESSURES DUES À DES DANGERS ÉLECTRIQUES, MÉCANIQUES OU AUTRES.**

- **DIESES KUNDENDIENST-HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.**
- **FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.**

WARNUNG

- **VERSUCHEN SIE NICHT, DAS GERÄT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST-HANDBUCH NICHT ZU RATE GEZOGEN UND VERSTANDEN WURDE.**
- **WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLÄGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.**

AVISO

- **ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS.**
- **SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEMS SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.**
- **NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.**
- **LA NO OBSERVANCIA DEL PRESENTE AVISO PUEDE DAR LUGAR A QUE EL PROVEEDOR DE SERVICIOS, EL OPERADOR O EL PACIENTE SUFRAN LESIONES PROVOCADAS POR CAUSAS ELÉCTRICAS, MECÁNICAS O DE OTRA NATURALEZA.**

ATENÇÃO

- **ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.**
- **SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEMS, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.**
- **NÃO TENTE REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.**
- **O NÃO CUMPRIMENTO DESTE AVISO PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A‘ CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.**

AVVERTENZA

- **IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.**
- **SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEMS RICHIEDE IL MANUALE IN UNA LINGUA DIVERSA, IL CLIENTE È TENUTO A PROVVEDERE DIRETTAMENTE ALLA TRADUZIONE.**
- **SI PROCEDA ALLA MANUTENZIONE DELL’APPARECCHIATURA SOLO DOPO AVER CONSULTATO IL PRESENTE MANUALE ED AVERNE COMPRESO IL CONTENUTO.**
- **NON TENERE CONTO DELLA PRESENTE AVVERTENZA POTREBBE FAR COMPIERE OPERAZIONI DA CUI DERIVINO LESIONI ALL’ADDETTO ALLA MANUTENZIONE, ALL’UTILIZZATORE ED AL PAZIENTE PER FOLGORAZIONE ELETTRICA, PER URTI MECCANICI OD ALTRI RISCHI.**

このサービスマニュアルには英語版しかありません。
ＧＥＭＳ以外でサービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。

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この警告に従わない場合、サービスを担当される方、操作員あるいは患者さんが、感電や機械的又はその他の危険により負傷する可能性があります。

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For USA Only Complete instructions regarding claim procedure are found in Section “S” of the Policy And Procedures Bulletins.

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All electrical Installations that are preliminary to positioning of the equipment at the site prepared for the equipment shall be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations and testing shall be performed by qualified GE Medical Systems personnel. In performing all electrical work on these products, GEwill use its own specially trained field engineers. All of GE’s electrical work on these products will comply with the requirements of the applicable electrical codes.

The purchaser of GE equipment shall only utilize qualified personnel (i.e., GE’s field engineers, personnel of third-party service companies with equivalent training, or licensed electricians) to perform electrical servicing on the equipment.

OMISSIONS & ERRORS

If there are any omissions, errors or suggestions for improving this documentation, please contact the GE Medical Systems Global Documentation Group with specific information listing the system type, manual title, part number, revision number, page number and suggestion details. E-mail the information to: **UltrasoundDocError@med.ge.com**

GE Medical Systems employees should use the Customer Quality Assurance (CQA) System to report all documentation omissions, errors or suggestions.

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Important Precautions pages i to iv	1	Chapter 3 - Installation pages 3-1 to 3-3 pages 3-4 to 3-10 pages 3-11 to 3-27 pages 3-28 to 3-34 pages 3-35 to 3-38	 1 0 1 0 1	Chapter 8 - Replacement Procedures pages 8-1 to 8-8	 1
Rev History/LOEP pages v to vi	1	Chapter 4 - Functional Checks pages 4-1 to 4-22 pages 4-23 to 4-28 pages 4-29 to 4-30 pages 4-31 to 4-32 pages 4-33 to 4-36	 0 1 0 1 0	Chapter 9 - Replacement Parts pages 9-1 to 9-3 pages 9-4 to 9-29 pages 9-30 to 9-34	 0 1 0
Table of Contents pages vii to xxii	1	Chapter 5 - Theory pages 5-1 to 5-22 pages 5-23 to 5-24 pages 5-25 to 5-42 pages 5-43 to 5-44	 0 1 0 1	Chapter 10 - Periodic Maintenance pages 10-1 to 10-8 page 10-9 pages 10-10 to 10-26	 0 1 0
Chapter 1 - Introduction pages 1-1 to 1-8 page 1-9 pages 1-10 to 1-12	 0 1 0	Chapter 6 - Service Adjustments pages 6-1 to 6-6	 0	Index pages I to IV	 1
				Back Cover	0

Table of Contents

CHAPTER 1
Introduction

Overview . . . . . 1 - 1
Purpose of Chapter 1 . . . . . 1 - 1
Purpose of Service Manual . . . . . 1 - 1
Typical Users of the Basic Service Manual . . . . . 1 - 2
Voluson® 730 Models Covered by this Manual . . . . . 1 - 2
Purpose of Operator Manual(s) . . . . . 1 - 2

Important Conventions . . . . . 1 - 3
Conventions Used in Book . . . . . 1 - 3
Standard Hazard Icons . . . . . 1 - 4
Product Icons . . . . . 1 - 5

Safety Considerations . . . . . 1 - 7
Introduction . . . . . 1 - 7
Human Safety . . . . . 1 - 7
Mechanical Safety . . . . . 1 - 7
Electrical Safety . . . . . 1 - 8
Labels Locations . . . . . 1 - 8
Dangerous Procedure Warnings . . . . . 1 - 9
Lockout/Tagout Requirements (For USA Only) . . . . . 1 - 9
Returning/Shipping Probes and Repair Parts . . . . . 1 - 9

EMC, EMI, and ESD . . . . . 1 - 10
Electromagnetic Compatibility (EMC) . . . . . 1 - 10
CE Compliance . . . . . 1 - 10
Electrostatic Discharge (ESD) Prevention . . . . . 1 - 10

Customer Assistance . . . . . 1 - 11
Contact Information . . . . . 1 - 11
System Manufacturer . . . . . 1 - 12

CHAPTER 2
Pre-Installation

Overview . . . . . 2 - 1
Purpose of Chapter 2 . . . . . 2 - 1

General Console Requirements. . . . . 2 - 2
Console Environmental Requirements . . . . . 2 - 2
Cooling . . . . . 2 - 2
Lighting . . . . . 2 - 2
Electrical Requirements . . . . . 2 - 2
Voluson® 730 Power Requirements . . . . . 2 - 2
Inrush Current . . . . . 2 - 2
Site Circuit Breaker . . . . . 2 - 3
Site Power Outlets . . . . . 2 - 3
Unit Power Plug . . . . . 2 - 3
EMI Limitations . . . . . 2 - 4
Scan Probe Environmental Requirements . . . . . 2 - 5
Time and Manpower Requirements . . . . . 2 - 5

Facility Needs . . . . . 2 - 6
Purchaser Responsibilities . . . . . 2 - 6
Required Features . . . . . 2 - 6
Desirable Features . . . . . 2 - 7
Minimal Floor Plan Suggestion . . . . . 2 - 8
Networking Pre-installation Requirements . . . . . 2 - 9
Purpose of the DICOM Network Function . . . . . 2 - 9
DICOM Option Pre-installation Requirements . . . . . 2 - 9

CHAPTER 3
Installation

Overview . . . . . 3 - 1
The Purpose of Chapter 3 . . . . . 3 - 1
Average Installation Time . . . . . 3 - 1
Installation Warnings . . . . . 3 - 2
Brake Pedal Operation . . . . . 3 - 2
Operator I/O Panel Position . . . . . 3 - 2
Safety Reminders . . . . . 3 - 3

Receiving and Unpacking the Equipment . . . . . 3 - 4

Preparing for Installation . . . . . 3 - 6
Connection of Auxiliary Devices . . . . . 3 - 6
Monitor Connection . . . . . 3 - 6
Connection of Peripherals . . . . . 3 - 6
Verify Customer Order . . . . . 3 - 7
Physical Inspection . . . . . 3 - 7
System Voltage Settings . . . . . 3 - 7
EMI Protection . . . . . 3 - 7

Completing the Installation . . . . . 3 - 8
System Specifications . . . . . 3 - 8
Physical Dimensions of Voluson® 730 . . . . . 3 - 8
Weight without Monitor and Peripherals . . . . . 3 - 8
Acoustic Noise Output . . . . . 3 - 8
Electrical Specifications . . . . . 3 - 8
Power On / Boot Up . . . . . 3 - 9
Scanner Power On . . . . . 3 - 9
Back-end Processor Boot Up . . . . . 3 - 9
Power Off/ Shutdown . . . . . 3 - 10
Back-end Processor Power Down . . . . . 3 - 10
Scanner Shutdown . . . . . 3 - 10
Transducer Connection . . . . . 3 - 11

Printer Installation . . . . . 3 - 12
Installing Line Printer HP 990cxi or HP 995c . . . . . 3 - 12
Install the HP printer software/driver . . . . . 3 - 12
Installing Digital Color Printer Sony UP-D21MD . . . . . 3 - 14
Install the UP-D21MD printer software/driver . . . . . 3 - 14
Installing Digital Color Printer (Sony UP-D2600S or Mitsubishi CP770DW) 3 - 16
Printer Installation manually . . . . . 3 - 17
Adjustment of Printer Settings . . . . . 3 - 23

HP 990cxi / HP 995c - Printer Settings . . . . . 3 - 24
UP-D21MD - Printer Settings . . . . . 3 - 25
CP770DW - Printer Settings . . . . . 3 - 26
Printer Remote Control Selection . . . . . 3 - 27

System Configuration. . . . . 3 - 28
System Configuration . . . . . 3 - 28
How to enter Date and Time . . . . . 3 - 29
How to enter Hospital Name . . . . . 3 - 29
How to change Language . . . . . 3 - 29
On-Board Optional Peripherals . . . . . 3 - 30
External I/O Connection Panel (GES) . . . . . 3 - 31
External I/O Pin Outs . . . . . 3 - 32
Video Specification . . . . . 3 - 34
Available Probes . . . . . 3 - 35
Software/Option Configuration . . . . . 3 - 35

Connectivity Installation Worksheet. . . . . 3 - 36

Network IP Address Configuration. . . . . 3 - 37

Paperwork . . . . . 3 - 38
Product Locator Installation . . . . . 3 - 38
User Manual(s) . . . . . 3 - 38

CHAPTER 4
Functional Checks

Overview . . . . . 4 - 1
Purpose of Chapter 4 . . . . . 4 - 1
Required Equipment . . . . . 4 - 1
General Procedure . . . . . 4 - 2
Power On / Boot Up . . . . . 4 - 2
Scanner Power On . . . . . 4 - 2
Power Off / Shutdown . . . . . 4 - 3
Scanner Shutdown . . . . . 4 - 3
System Features . . . . . 4 - 4
Control Panel . . . . . 4 - 4
Touch Panel . . . . . 4 - 5
Monitor Display . . . . . 4 - 6
Functional Checks . . . . . 4 - 7
2D-Mode Checks . . . . . 4 - 7
M-Mode Checks . . . . . 4 - 10
Spectral Doppler Mode Checks . . . . . 4 - 11
Color Doppler Mode Checks . . . . . 4 - 12
Volume Mode Checks . . . . . 4 - 14
Pre-Volume Mode Functions . . . . . 4 - 14
Functions after the 3D Acquisition . . . . . 4 - 15
Functions in the Tool Menu . . . . . 4 - 16
Using Cine-Mode . . . . . 4 - 17
Activating Cine . . . . . 4 - 17
Cine-Split Function (Multiple Format) . . . . . 4 - 17
Activating 2D Auto Cine . . . . . 4 - 17
Spectral Doppler- or M-Cine Loop . . . . . 4 - 17
Activating 3D Rotation Cine . . . . . 4 - 17
Activating 4D Cine . . . . . 4 - 17
Activating Live 3D Cine . . . . . 4 - 17
Basic Measurements . . . . . 4 - 18
Distance and Tissue DepthMeasurements (B- and M-Mode) . . . . . 4 - 18
Circumference/Area (using Ellipse or Trace) Measurements . . . . . 4 - 19
Volume Measurements . . . . . 4 - 19
3D Multi-Plane Measurements . . . . . 4 - 19
Velocity Measurements (Spectral Doppler Mode) . . . . . 4 - 20
Acceleration Velocity and Velocity Ratio . . . . . 4 - 20
Average Velocity (Manual Trace) . . . . . 4 - 20
Average Velocity (Auto Trace) . . . . . 4 - 20
Calculation Measurements . . . . . 4 - 21

OB Calculations . . . . 4 - 21
GYN Calculations . . . . 4 - 21
Cardiac Calculations . . . . 4 - 21
Vascular Calculations . . . . 4 - 21
Report Pages . . . . 4 - 21
Probe/Connectors Usage . . . . 4 - 22
Connecting a probe . . . . 4 - 22
Activating the probe . . . . 4 - 22
Deactivating the probe . . . . 4 - 22
Disconnecting the probe . . . . 4 - 22
Image Management (Sonoview) . . . . 4 - 23
Using the MOD (Magneto-Optical Drive) . . . . 4 - 24
Backup and Restore Database, Preset Configurations and Images . . . . 4 - 25
Formatting Media . . . . 4 - 25
Save System Presets and Configurations (Application Settings) . . . 4 - 27
Load System Presets and Configurations (Application Settings) . . . 4 - 28
Archiving Images . . . . 4 - 30
ECG Check Out . . . . 4 - 31

Software Configuration Checks . . . . 4 - 31

Peripheral Checks . . . . 4 - 32

Mechanical Function Checks . . . . 4 - 33
Rotation of the Control Console . . . . 4 - 33
Brakes and Direction Locks . . . . 4 - 33
Power Supply Adjustment . . . . 4 - 34

Site Log . . . . 4 - 35
Site Log - System (Service Database) . . . . 4 - 35
Site Log - Paper Documentation . . . . 4 - 36

CHAPTER 5
Components and Functions (Theory)

Overview . . . . . 5 - 1
Purpose of Chapter 5 . . . . . 5 - 1

General Information . . . . . 5 - 2
Description of Voluson® 730 Operating Modes . . . . . 5 - 6
B-Mode or 2D-Mode: . . . . . 5 - 6
M-Mode: . . . . . 5 - 6
Color Doppler Mode: . . . . . 5 - 6
Color Flow Mode: . . . . . 5 - 6
Power Doppler: . . . . . 5 - 6
Pulsed (PW) Doppler: . . . . . 5 - 7
3D Imaging . . . . . 5 - 7
3D Data Collection and Reconstruction: . . . . . 5 - 7
3D Image Presentation: . . . . . 5 - 8
3D Rendering: . . . . . 5 - 8
Blockdiagram Voluson® 730 . . . . . 5 - 9
Dataflow Control Description . . . . . 5 - 10
B-Mode . . . . . 5 - 10
M-Mode . . . . . 5 - 11
D-Mode (Pulsed Wave- and Continuous Wave Doppler) . . . . . 5 - 12
CFM-Mode (Color Flow Mode) . . . . . 5 - 12
3D-Mode . . . . . 5 - 13
Real Time 4D-Mode . . . . . 5 - 13
External Video Mode (Video display from VCR) . . . . . 5 - 14
Description of Software Options . . . . . 5 - 15
Real Time 4D . . . . . 5 - 15
DICOM . . . . . 5 - 15
Real Time 4D-Biopsy . . . . . 5 - 15
VOCAL - Virtual Organ Computer-aided Analysis . . . . . 5 - 15
Tissue Harmonic Imaging (THI) . . . . . 5 - 16
Sonoview – Image Management . . . . . 5 - 16
CRI - Compound Resolution Imaging . . . . . 5 - 16
Tissue Doppler Imaging . . . . . 5 - 16
VCI - Volume Contrast Imaging . . . . . 5 - 16
Description of Hardware Options . . . . . 5 - 17
CW - Continuous Wave Doppler . . . . . 5 - 17
ECG Digital Module . . . . . 5 - 17
Scan freeze Footswitch . . . . . 5 - 17

Main board Chassis GEF Module . . . . . 5 - 18

Front End Processor . . . . . 5 - 19
Front End - Board Descriptions . . . . . 5 - 21

CPU - Probe Board . . . . . 5 - 21
CPR - Beamformer Board . . . . . 5 - 21
CPD-Beamformer-Sub-board . . . . . 5 - 21
CRW - (old version: CWD) CW-Doppler Board (Optional) . . . . . 5 - 21
CPZ - Cover Board . . . . . 5 - 21
CPG - MID-Processor Board . . . . . 5 - 22
CPC - Control Board . . . . . 5 - 22
CPF - Doppler+CFM Board . . . . . 5 - 22
CCM - Motor Control Board . . . . . 5 - 23
CPP- Power Supply Secondary Board + Motor Power stage . . . . . 5 - 23
CPK - Motherboard of GEF-Module . . . . . 5 - 23

Back End Processor . . . . . 5 - 24
Blockdiagram CPS . . . . . 5 - 25
Back End - Board Descriptions . . . . . 5 - 26
SBC - Single Board Computer . . . . . 5 - 26
CPS - DMA-Controller-Card . . . . . 5 - 26
CKV - Video-Card . . . . . 5 - 26
Hard Disk Drive . . . . . 5 - 26
CPE - Back Panel I/O-Card . . . . . 5 - 26
CPM - PC-Motherboard card . . . . . 5 - 26
CPP- Power Supply Secondary Board + Motor Power stage . . . . . 5 - 27

Internal I/O . . . . . 5 - 28

Top Console. . . . . 5 - 31

Monitor . . . . . 5 - 32

External I/O . . . . . 5 - 33

Peripherals. . . . . 5 - 34
General Information: . . . . . 5 - 34
ECG-preamplifier (MAN6 - optional) . . . . . 5 - 34
CD-RW Drive . . . . . 5 - 34
Magneto-Optical Drive . . . . . 5 - 34

Power Distribution . . . . . 5 - 35
CPN-Module (Primary Power Module) . . . . . 5 - 35
Mechanical Concept and Overview . . . . . 5 - 35
Major Functions of CPN . . . . . 5 - 35
Fuses on Rear Panel . . . . . 5 - 36
Fuses inside CPN . . . . . 5 - 36

Mechanical Descriptions . . . . . 5 - 37
Physical Dimensions . . . . . 5 - 37
Monitor . . . . . 5 - 38

Top Console Positioning . . . . . 5 - 38
Rotation of the Control Console . . . . . 5 - 38
Assembly Drawing GW & GEU & Monitor . . . . . 5 - 39

Air Flow Control . . . . . 5 - 40
Air Flow Distribution . . . . . 5 - 40
Air Flow Distribution Overview: . . . . . 5 - 40

Service Page . . . . . 5 - 41
Introduction . . . . . 5 - 41
Access / Security . . . . . 5 - 41
Service Login . . . . . 5 - 41
Auto Tester File . . . . . 5 - 42
Service Viewer . . . . . 5 - 43
Export System Status . . . . . 5 - 43
Export Event Log . . . . . 5 - 43
Delete all Patients . . . . . 5 - 43
Maintenance Report . . . . . 5 - 43
Export System Data . . . . . 5 - 44
Update . . . . . 5 - 44
EUM . . . . . 5 - 44
NLS . . . . . 5 - 44
Printer . . . . . 5 - 44

CHAPTER 6
Service Adjustments

Overview . . . . . 6 - 1
Purpose of Chapter 6 . . . . . 6 - 1

Regulatory . . . . . 6 - 1

Monitor Adjustment . . . . . 6 - 2

Control Console, Transport Lock . . . . . 6 - 4
Control Console . . . . . 6 - 4
Transport Lock . . . . . 6 - 4

Trackball Adjustment . . . . . 6 - 5

CHAPTER 7
Diagnostics/Troubleshooting

Overview . . . . . 7 - 1
Purpose of Chapter 7 . . . . . 7 - 1
Overview . . . . . 7 - 1

Collect Vital System Information . . . . . 7 - 2

Check Points Voltages . . . . . 7 - 3
How to check power . . . . . 7 - 3

Screen Captures and Logs . . . . . 7 - 4
Capturing a screen . . . . . 7 - 4
Export Log's and System Data's . . . . . 7 - 4
Export Event Log . . . . . 7 - 4
Export System Data . . . . . 7 - 4
Export System Status . . . . . 7 - 4

How to use the Auto Tester program . . . . . 7 - 5

Minimum Cable Configuration to Boot . . . . . 7 - 8
Minimum Cable Configuration to Scan . . . . . 7 - 9

Troubleshooting Trees and Instructions . . . . . 7 - 10
System does not Power On / Boot Up . . . . . 7 - 10
Noise in Image . . . . . 7 - 11
Trackball . . . . . 7 - 12
System does not Power Off / Shutdown . . . . . 7 - 13
Monitor Troubleshooting . . . . . 7 - 14
Unable to Record to VCR . . . . . 7 - 15
Printer Troubleshooting . . . . . 7 - 16
CD-RW Troubleshooting (CD-Rom Drive) . . . . . 7 - 18
MOD Troubleshooting . . . . . 7 - 18
Audio Test . . . . . 7 - 18
Network Troubleshooting . . . . . 7 - 19
No Connection to the Network at All . . . . . 7 - 19

Error Messages . . . . . 7 - 20

CHAPTER 8
Replacement Procedures

Overview . . . . . 8 - 1
Purpose of Chapter 8 . . . . . 8 - 1
Returning/Shipping Probes and Repair Parts . . . . . 8 - 1

Backup Loading Procedure . . . . . 8 - 2
Loading Procedure . . . . . 8 - 2

EUM (Electronic User Manual) Upgrade Procedure . . . . . 8 - 3
EUM - Upgrade Procedure (up to Software Version 1.06F) . . . . . 8 - 3
EUM - Upgrade Procedure (from Software Version 1.06G) . . . . . 8 - 5
EUM - Removal Procedure . . . . . 8 - 5
EUM - Installation Procedure . . . . . 8 - 7

Replacement of the Trackball top fixation ring . . . . . 8 - 8
Manpower . . . . . 8 - 8
Trackball top fixation ring - Replacement Procedure . . . . . 8 - 8

CHAPTER 9
Renewal Parts

Overview . . . . . 9 - 1
Purpose of Chapter 9 . . . . . 9 - 1
List of Abbreviations . . . . . 9 - 2
Parts List Groups . . . . . 9 - 3
Housing (GW) and additional Console Hardware . . . . . 9 - 4
User Interface (GEU) + Monitor . . . . . 9 - 6
Disk Drives (GEM) . . . . . 9 - 9
Main Power Module (CPN) . . . . . 9 - 10
Main Board Module (GEF) . . . . . 9 - 11
FrontEnd (US-Part) . . . . . 9 - 12
BackEnd Processor (PC-Part) . . . . . 9 - 16
Options and Upgrades . . . . . 9 - 18
Miscellaneous Cables . . . . . 9 - 19
Optional Peripherals and Accessories . . . . . 9 - 25
Probes . . . . . 9 - 29
2D-Probes . . . . . 9 - 29
Real-Time 4D Volume Probes . . . . . 9 - 31
CW-Pencil Probes . . . . . 9 - 32
Live 3D Probes . . . . . 9 - 33

CHAPTER 10
Periodic Maintenance

Overview . . . . . 10 - 1
Purpose of Chapter 10 . . . . . 10 - 1

Why do Periodic Maintenance . . . . . 10 - 2
Keeping Records . . . . . 10 - 2
Quality Assurance . . . . . 10 - 2

Periodic Maintenance Schedule . . . . . 10 - 2
How often should PMs be performed? . . . . . 10 - 2

Tools Required. . . . . 10 - 5
Special Tools, Supplies and Equipment . . . . . 10 - 5
Specific Requirements for Periodic Maintenance . . . . . 10 - 5

System Periodic Maintenance . . . . . 10 - 6
Preliminary Checks . . . . . 10 - 6
Functional Checks (See Also Chapter 4) . . . . . 10 - 7
System Checks . . . . . 10 - 7
Peripheral/Option Checks . . . . . 10 - 8
Input Power . . . . . 10 - 8
Mains Cable Inspection . . . . . 10 - 8
Cleaning . . . . . 10 - 8
General Cleaning . . . . . 10 - 8
Physical Inspection . . . . . 10 - 9
Optional Diagnostic Checks . . . . . 10 - 10
Probe Maintenance . . . . . 10 - 10
Probe Related Checks . . . . . 10 - 10
Basic Probe Care . . . . . 10 - 10
Basic Probe Cleaning . . . . . 10 - 10

Using a Phantom . . . . . 10 - 11

Electrical Safety Tests . . . . . 10 - 11
Safety Test Overview . . . . . 10 - 11
GEMS Leakage Current Limits . . . . . 10 - 12
Outlet Test - Wiring Arrangement - USA & Canada . . . . . 10 - 13
Grounding Continuity . . . . . 10 - 14
Meter Procedure . . . . . 10 - 14
Chassis Leakage Current Test . . . . . 10 - 15
Definition . . . . . 10 - 15
Generic Procedure . . . . . 10 - 15

Data Sheet for Chassis Source Leakage Current . . . . . 10 - 17
Isolated Patient Lead (Source) Leakage–Lead to Ground . . . . . 10 - 17
Definition . . . . . 10 - 17
Generic Procedure . . . . . 10 - 18
Isolated Patient Lead (Source) Leakage–Lead to Lead . . . . . 10 - 18
Isolated Patient Lead (Sink) Leakage-Isolation Test . . . . . 10 - 19
Data Sheet for ECG Leakage Current . . . . . 10 - 20
Probe Leakage Current Test . . . . . 10 - 21
Definition . . . . . 10 - 21
Generic Procedure . . . . . 10 - 21
No Meter Probe Adapter Procedure . . . . . 10 - 22
Data Sheet for Transducer Source Leakage Current . . . . . 10 - 23

When There's Too Much Leakage Current... . . . . 10 - 24

Chapter 1
Introduction

Section 1-1
Overview

1-1-1 Purpose of Chapter 1

This chapter describes important issues related to safely servicing the Voluson® 730 scanner. The service provider must read and understand all the information presented in this manual before installing or servicing a unit.

Table 1-1 Contents in Chapter 1

Section	Description	Page Number
1-1	Overview	1-1
1-2	Important Conventions	1-3
1-3	Safety Considerations	1-7
1-4	EMC, EMI, and ESD	1-10
1-5	Customer Assistance	1-11

1-1-2 Purpose of Service Manual

This Service Manual provides installation and service information for the Voluson® 730 Ultrasound Scanning System and contains the following chapters:

1.) **Chapter 1 - Introduction:** Contains a content summary and warnings.
2.) **Chapter 2 - Pre-Installation:** Contains pre-installation requirements for the Voluson® 730.
3.) **Chapter 3 - Installation:** Contains installation procedures.
4.) **Chapter 4 - Functional Checks:** Contains functional checks that are recommended as part of the installation, or as required during servicing and periodic maintenance.
5.) **Chapter 5 - Components and Functions (Theory):** Contains block diagrams and functional explanations of the electronics.
6.) **Chapter 6 - Service Adjustments:** Contains instructions on how to make available adjustments to the Voluson® 730.
7.) **Chapter 7 - Diagnostics/Troubleshooting:** Provides procedures for running diagnostic or related routines for the Voluson® 730.
8.) **Chapter 8 - Replacement Procedures:** Provides disassembly procedures and reassembly procedures for all changeable Field Replaceable Units (FRU).
9.) **Chapter 9 - Renewal Parts:** Contains a complete list of field replaceable parts for the Voluson® 730.
10.) **Chapter 10 - Periodic Maintenance:** Provides periodic maintenance procedures for the Voluson® 730.

1-1-3 Typical Users of the Basic Service Manual

- Service Personnel (installation, maintenance, etc.).
- Hospital's Service Personnel
- Contractors (Some parts of Chapter 2 - Pre-Installation)

1-1-4 Voluson® 730 Models Covered by this Manual

Table 1-2 Voluson® 730 Model Designations

GE Part Number	Kretz #	Description
H46601A	154585	Voluson® 730 Main Body

1-1-5 Purpose of Operator Manual(s)

The Operator Manual(s) should be fully read and understood before operating the Voluson® 730 and also kept near the unit for quick reference.

Section 1-2
Important Conventions

1-2-1 Conventions Used in Book

Icons

Pictures, or icons, are used wherever they reinforce the printed message. The icons, labels and conventions used on the product and in the service information are described in this chapter.

Safety Precaution Messages

Various levels of safety precaution messages may be found on the equipment and in the service information. The different levels of concern are identified by a flag word that precedes the precautionary message. Known or potential hazards are labeled in one of following ways:

DANGER **DANGER IS USED TO INDICATE THE PRESENCE OF A HAZARD THAT WILL CAUSE SEVERE PERSONAL INJURY OR DEATH IF THE INSTRUCTIONS ARE IGNORED.**

WARNING ***WARNING IS USED TO INDICATE THE PRESENCE OF A HAZARD THAT CAN CAUSE SEVERE PERSONAL INJURY AND PROPERTY DAMAGE IF INSTRUCTIONS ARE IGNORED.***

CAUTION **Caution is used to indicate the presence of a hazard that will or can cause minor personal injury and property damage if instructions are ignored.**

NOTICE **Equipment Damage Possible**

Notice is used when a hazard is present that can cause property damage but has absolutely no personal injury risk.

Example: Disk drive will crash.

NOTE: Notes provide important information about an item or a procedure. Information contained in a NOTE can often save you time or effort.

1-2-2 Standard Hazard Icons

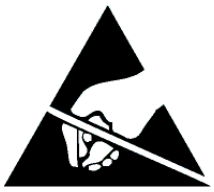
Important information will always be preceded by the exclamation point contained within a triangle, as seen throughout this chapter. In addition to text, several different graphical icons (symbols) may be used to make you aware of specific types of hazards that could cause harm.

Table 1-3 Standard Hazard Icons

ELECTRICAL	MECHANICAL	RADIATION
LASER	**HEAT**	**PINCH**

Other hazard icons make you aware of specific procedures that should be followed.

Table 1-4 Standard Icons Indicating a Special Procedure Be Used

AVOID STATIC ELECTRICITY	TAG AND LOCK OUT	WEAR EYE PROTECTION
		

1-2-3 Product Icons

The following table describes the purpose and location of safety labels and other important information provided on the equipment.

Table 1-5 Product Icons

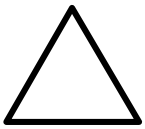
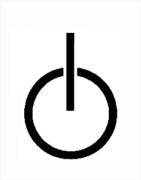
LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
Identification and Rating Plate	Manufacturer's name and address Model and serial numbers Electrical ratings	Rear side of the unit Monitor rear side On each probe
Device Listing/Certification Labels	Laboratory logo or labels denoting conformance with industry safety standards such as UL or IEC.	Rear side of the unit Rear side of the monitor
Type/Class Label	Used to indicate the degree of safety or protection.	
IP Code (IPX 1) IP Code (IPX 7)	Indicates the degree of protection provided by the enclosure per IEC 529.IPX 1 and IPX 7 indicates drip proof.	Footswitch Probes
	Equipment Type BF (man in the box symbol) IEC 878-02-03 indicates B Type equipment having even more electrical isolation than standard Type B equipment because it is intended for intimate patient contact.	Probe connectors Front side of the ECG-preamplifier (MAN) Rear of Power Supply
"CAUTION This unit weighs... Special care must be used to avoid..." 	This precaution is intended to prevent injury that may result if one person attempt to move the unit considerable distances or on an incline due to the weight of the unit.	
	"CAUTION" The equilateral triangle is usually used in combination with other symbols to advise or warn the user.	Various
	ATTENTION - Consult accompanying documents " is intended to alert the user to refer to the operator manual or other instructions when complete information cannot be provided on the label.	Rear side of Power Supply

Table 1-5 Product Icons (Continued)

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
	"CAUTION - Dangerous voltage" (the lightning flash with arrowhead in equilateral triangle) is used to indicate electric shock hazards.	Rear side of Monitor
	"Mains OFF" Indicates the power off position of the mains power switch.	Rear of system at mains switch (F1)
	"OFF/Standby" Indicates the power off/ standby position of the power switch. **CAUTION** **This Power Switch DOES NOT ISOLATE Mains Supply**	Adjacent to On-Off/Standby switch left below the Control panel.
	"Mains ON" Indicates the power on position of the mains power switch.	Rear of system at mains switch (F1)
	ON switch of the isolation transformer for auxiliary devices.	Rear of system at the switch for auxiliary devices (F2)
	OFF switch of the isolation transformer for auxiliary devices.	Rear of system at the switch for auxiliary devices (F2)
	"Protective Earth" Indicates the protective earth (grounding) terminal.	Internal, Rear side of Power Supply
	"Equipotentiality" Indicates the terminal to be used for connecting equipotential conductors when interconnecting (grounding) with other equipment.	Rear side of Power Supply

Section 1-3
Safety Considerations

1-3-1 Introduction

The following safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual, violates safety standards of design, manufacture and intended use of the equipment.

1-3-2 Human Safety

Operating personnel must not remove the system covers.
Servicing should be performed by authorized personnel only.
Only personnel who have participated in a Voluson® 730 Training are authorized to service the equipment.

1-3-3 Mechanical Safety

WARNING ***WHEN THE UNIT IS RAISED FOR A REPAIR OR MOVED ALONG ANY INCLINE, USE EXTREME CAUTION SINCE IT MAY BECOME UNSTABLE AND TIP OVER.***

WARNING ***ULTRASOUND PROBES ARE HIGHLY SENSITIVE MEDICAL INSTRUMENTS THAT CAN EASILY BE DAMAGED BY IMPROPER HANDLING. USE CARE WHEN HANDLING AND PROTECT FROM DAMAGE WHEN NOT IN USE. DO NOT USE A DAMAGED OR DEFECTIVE PROBE. FAILURE TO FOLLOW THESE PRECAUTIONS CAN RESULT IN SERIOUS INJURY AND EQUIPMENT DAMAGE.***

WARNING ***NEVER USE A PROBE THAT HAS FALLEN TO THE FLOOR. EVEN IF IT LOOKS OK, IT MAY BE DAMAGED.***

CAUTION **Always lower and center the Operator I/O Panel before moving the scanner.**

CAUTION **The Voluson® 730 weighs 136 kgor more, depending on installed peripherals, (300 lbs., or more) when ready for use. Care must be used when moving it or replacing its parts. Failure to follow the precautions listed could result in injury, uncontrolled motion and costly damage.**

ALWAYS:

Be sure the pathway is clear.

Use slow, careful motions.

Use two people when moving on inclines or lifting more than 16 kg (35 lbs).

1-3-3 Mechanical Safety (cont'd)

NOTE: Special care should be taken when transporting the unit in a vehicle:

- *Secure the unit in an upright position.*
- *Lock the wheels (brake)*
- *DO NOT use the Control Panel as an anchor point.*
- *Place the probes in their carrying case.*
- *Eject any Magneto Optical disk or CD from their drive.*

⚠ **CAUTION** **Keep the heat venting holes on the monitor unobstructed to avoid overheating of the monitor.**

1-3-4 Electrical Safety

To minimize shock hazard, the equipment chassis must be connected to an electrical ground. The system is equipped with a three-conductor AC power cable. This must be plugged into an approved electrical outlet with safety ground. If an extension cord is used with the system, make sure that the total current rating of the system does not exceed the extension cord rating.

The power outlet used for this equipment should not be shared with other types of equipment.

Both the system power cable and the power connector meet international electrical standards.

1-3-5 Labels Locations

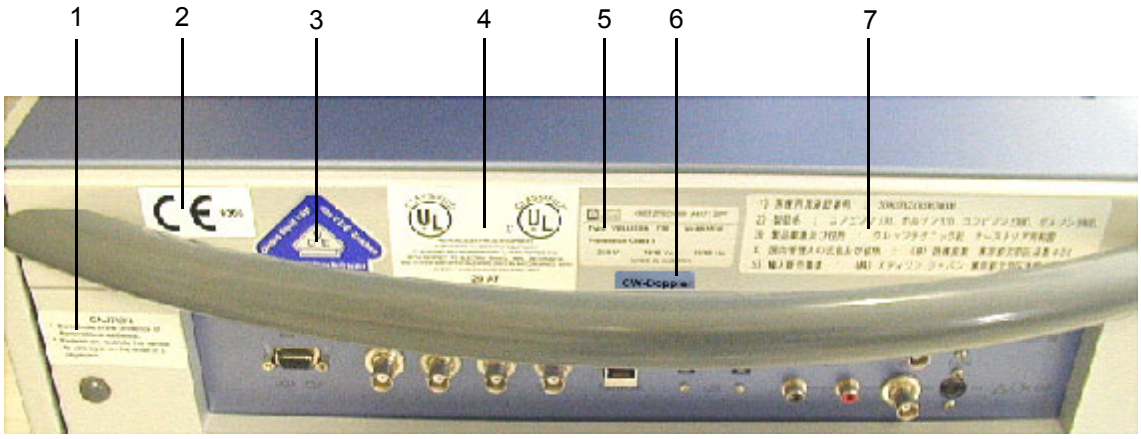


Figure 1-1 Labeling

1.) Caution Label
2.) CE-Label
3.) VDE-Label
4.) UL-Label
5.) Identification plate
6.) CW-Doppler (only if the CW-Doppler option is installed)
7.) Homologation label (for Japan only)

1-3-6 Dangerous Procedure Warnings

Warnings, such as the examples below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

DANGER **DANGEROUS VOLTAGES, CAPABLE OF CAUSING DEATH, ARE PRESENT IN THIS EQUIPMENT. USE EXTREME CAUTION WHEN HANDLING, TESTING AND ADJUSTING.**

WARNING ***EXPLOSION WARNING***

DO NOT OPERATE THE EQUIPMENT IN AN EXPLOSIVE ATMOSPHERE. OPERATION OF ANY ELECTRICAL EQUIPMENT IN SUCH AN ENVIRONMENT CONSTITUTES A DEFINITE SAFETY HAZARD.

WARNING ***DO NOT SUBSTITUTE PARTS OR MODIFY EQUIPMENT***

BECAUSE OF THE DANGER OF INTRODUCING ADDITIONAL HAZARDS, DO NOT INSTALL SUBSTITUTE PARTS OR PERFORM ANY UNAUTHORIZED MODIFICATION OF THE EQUIPMENT.

1-3-7 Lockout/Tagout Requirements (For USA Only)

Follow OSHA Lockout/Tagout requirements by ensuring you are in total control of the electrical Mains plug.

1-3-8 Returning/Shipping Probes and Repair Parts

Equipment being returned must be clean and free of blood and other infectious substances.

GEMS policy states that body fluids must be properly removed from any part or equipment prior to shipment. GEMS employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstance should a part or equipment with visible body fluids be taken or shipped from a clinic or site (for example, body coils or and ultrasound probe).

The purpose of the regulation is to protect employees in the transportation industry, as well as the people who will receive or open this package.

The US Department of Transportation (DOT) has ruled that "items what were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care" are "regulated medical waste" for transportation purpose and must be transported as a hazardous material.

Section 1-4
EMC, EMI, and ESD

1-4-1 Electromagnetic Compatibility (EMC)

Electromagnetic compatibility describes a level of performance of a device within its electromagnetic environment. This environment consists of the device itself and its surroundings including other equipment, power sources and persons with which the device must interface. Inadequate compatibility results when a susceptible device fails to perform as intended due interference from its environment or when the device produces unacceptable levels of emission to its environment. This interference is often referred to as radio–frequency or electromagnetic interference (RFI/EMI) and can be radiated through space or conducted over interconnecting power of signal cables. In addition to electromagnetic energy, EMC also includes possible effects from electrical fields, magnetic fields, electrostatic discharge and disturbances in the electrical power supply.

For applicable standards refer to Chapter 2 in the Basic User Manual.

1-4-2 CE Compliance

The Voluson® 730 unit conforms to all applicable conducted and radiated emission limits and to immunity from electrostatic discharge, radiated and conducted RF fields, magnetic fields and power line transient requirements.

NOTE: ***For CE Compliance, it is critical that all covers, screws, shielding, gaskets, mesh, clamps, are in good condition, installed tightly without skew or stress. Proper installation following all comments noted in this service manual is required in order to achieve full EMC performance.***

1-4-3 Electrostatic Discharge (ESD) Prevention

⚠ **WARNING** ***DO NOT TOUCH ANY BOARDS WITH INTEGRATED CIRCUITS PRIOR TO TAKING THE NECESSARY ESD PRECAUTIONS:***

1.ALWAYS CONNECT YOURSELF, VIA AN ARM-WRIST STRAP, TO THE EQUIPOTENTIALITY CONNECTION POINT LOCATED ON THE REAR OF THE SCANNER (TO THE RIGHT OF THE POWER CONNECTOR).

2.FOLLOW GENERAL GUIDELINES FOR HANDLING OF ELECTROSTATIC SENSITIVE EQUIPMENT.

Section 1-5
Customer Assistance

1-5-1 Contact Information

If this equipment does not work as indicated in this service manual or in the Basic User Manual, or if you require additional assistance, please contact the local distributor or appropriate support resource, as listed below.

NOTE: Prepare the following information before you call:

- System ID serial number.
- Software version.

Table 1-6 Phone Numbers for Customer Assistance

Location	Phone Number
USA/ Canada GE Medical Systems Ultrasound Service Engineering 4855 W. Electric Avenue Milwaukee, WI 53219 Customer Answer Center	1-800-437-1171 1-800-682-5327 1-262-524-5698 Fax: +1-414-647-4125
Latin America GE Medical Systems Ultrasound Service Engineering 4855 W. Electric Avenue Milwaukee, WI 53219 Customer Answer Center	1-262-524-5300 1-262-524-5698 Fax: +1-414-647-4125
Europe GE Medical Systems Kretztechnik GmbH & Co OHG Service Department - Ultrasound Tiefenbach 15 A-4871 Zipf Austria Customer Answer Center	Tel: +43 7683 3800-0 Fax: +43 7682 3800-47 Tel: +33-13083-1300
Asia GE Ultrasound Asia Service Department - Ultrasound 298 Tiong Bahru Road #15-01/06 Central Plaza Singapore 169730	Tel: +65 6291-8528 +81 426-482950 Fax: +65 6272-7006

1-5-2 System Manufacturer

Table 1-7 System Manufacturer

Manufacturer	Telephone	FAX
GE Medical Systems Kretztechnik GmbH & Co OHG Tiefenbach 15 A-4871 Zipf Austria	+43-7682-3800-0	+43-7682-3800-47

Chapter 2
Pre-Installation

Section 2-1
Overview

2-1-1 Purpose of Chapter 2

This chapter provides the information required to plan and prepare for the installation of a Voluson® 730. Included are descriptions of the facility and electrical needs to be met by the purchaser of the unit.

Table 2-1 Contents in Chapter 2

Section	Description	Page Number
2-1	Overview	2-1
2-2	General Console Requirements	2-2
2-3	Facility Needs	2-6

Section 2-2
General Console Requirements

2-2-1 Console Environmental Requirements

Table 2-2 Environmental Requirements

Operating Temperature	Operating Humidity	Heat Dissipation	Storage Temperature	Storage Humidity
10 to 40°C (50 to 104°F)	30 to 80% rH non-condensing	2500 BTU pr hour	-10 to 40 °C (14 to 104°F)	< 90% rH non-condensing

2-2-1-1 Cooling

The cooling requirement for the Voluson® 730 is 2500 BTU/hr This figure does not include cooling needed for lights, people, or other equipment in the room. Each person in the room places an additional 300 BTU/hr. demand on the cooling system.

2-2-1-2 Lighting

Bright light is needed for system installation, updates and repairs. However, operator and patient comfort may be optimized if the room light is subdued and indirect. Therefore a combination lighting system (dim/bright) is recommended. Keep in mind that lighting controls and dimmers can be a source of EMI which could degrade image quality. These controls should be selected to minimize possible interference.

2-2-2 Electrical Requirements

NOTE: GE Medical Systemsrequires a dedicated power and ground for the proper operation of its Ultrasound equipment. This dedicated power shall originate at the last distribution panel before the system. The dedicated line shall consist of one phase, a neutral (not shared with any other circuit), and a full size ground wire from the distribution panel to the Ultrasound outlet. Please note that image artifacts can occur, if at any time within the facility, the ground from the main facility's incoming power source to the Ultrasound unit is only a conduit.

2-2-2-1 Voluson® 730 Power Requirements

Table 2-3 Electrical Specifications for Voluson® 730

Voltage	Tolerances	Current	Frequency
100 VAC	±10%	10.10 A	50, 60 Hz (±2%)
115 VAC	±10%	8.80 A	50, 60 Hz (±2%)
130 VAC	±10%	7.80 A	50, 60 Hz (±2%)
230 VAC	±10%	4.40 A	50, 60 Hz (±2%)
240 VAC	±10%	4.20 A	50, 60 Hz (±2%)

2-2-2-2 Inrush Current

Inrush current is not a factor to consider due to the inrush current limiting properties of the power supplies.

2-2-2-3 Site Circuit Breaker

It is recommended that the branch circuit breaker for the machine be readily accessible.

CAUTION **POWER OUTAGE MAY OCCUR.**

The Voluson® 730 requires a dedicated single branch circuit. To avoid circuit overload and possible loss of critical care equipment, make sure you DO NOT have any other equipment operating on the same circuit.

2-2-2-4 Site Power Outlets

A dedicated AC power outlet must be within reach of the unit without extension cords. Other adequate outlets for the external peripherals, medical and test equipment needed to support this unit must also be present within 1 m (3.2 ft.) of the unit. Electrical installation must meet all current local, state, and national electrical codes.

2-2-2-5 Unit Power Plug

If the unit arrives without a power plug, or with the wrong plug, you must contact your GEdealer or the installation engineer must supply what is locally required.

2-2-3 EMI Limitations

Ultrasound machines are susceptible to Electromagnetic Interference (EMI) from radio frequencies, magnetic fields, and transients in the air or wiring. Ultrasound machines also generate EMI. The Voluson® 730 complies with limits as stated on the EMC label. However, there is no guarantee that interference will not occur in a particular installation.

Possible EMI sources should be identified before the unit is installed.

Electrical and electronic equipment may produce EMI unintentionally as the result of a defect. These sources include:

- medical lasers,
- scanners,
- cauterizing guns,
- computers,
- monitors,
- fans,
- gel warmers,
- microwave ovens,
- light dimmers
- portable phones.

The presence of a broadcast station or broadcast van may also cause interference.

See Table 2-4 for EMI Prevention tips.

Table 2-4 EMI Prevention/Abatement

EMI Rule	Details
Be aware of RF sources	Keep the unit at least 5 meters or 15 feet away from other EMI sources. Special shielding may be required to eliminate interference problems caused by high frequency, high powered radio or video broadcast signals.
Ground the unit	Poor grounding is the most likely reason a unit will have noisy images. Check grounding of the power cord and power outlet.
Replace all screws, RF gaskets, covers, cores	After you finish repairing or updating the system, replace all covers and tighten all screws. Any cable with an external connection requires a magnet wrap at each end. Install the shield over the front of card cage. Loose or missing covers or RF gaskets allow radio frequencies to interfere with the ultrasound signals.
Replace broken RF gaskets	If more than 20% or a pair of the fingers on an RF gasket are broken, replace the gasket. Do not turn on the unit until any loose metallic part is removed.
Do not place labels where RF gaskets touch metal	Never place a label where RF gaskets meet the unit. Otherwise, the gap created will permit RF leakage. Or, if a label has been found in such a position, move the label.
Use GE specified harnesses and peripherals	The interconnect cables are grounded and require ferrite beads and other shielding. Also, cable length, material, and routing are all important; do not change from what is specified.
Take care with cellular phones	Cellular phones may transmit a 5 V/m signal; that could cause image artifacts.
Properly dress peripheral cables	Do not allow cables to lie across the top of the card cage or hang out of the peripheral bays. Loop the excess length for peripheral cables inside the peripheral bays. Attach the monitor cables to the frame.

2-2-4 Scan Probe Environmental Requirements

Operation:1Ambient temperature 18° to 30° C

Storage:-10° to 50° C

NOTE: Temperature in degrees C. Conversion to degrees F = °C (9/5) + 32).

NOTICE SYSTEMS AND ELECTRONIC PROBES ARE DESIGNED FOR STORAGE TEMPERATURES OF -10 TO + 50 degrees C. WHEN EXPOSED TO LARGE TEMPERATURE VARIATIONS, THE PRODUCT SHOULD BE KEPT IN ROOM TEMPERATURE FOR 10 HOURS BEFORE USE.

2-2-5 Time and Manpower Requirements

Site preparation takes time. Begin Pre-installation checks as soon as possible. If possible, allow six weeks before delivery, for enough time to make necessary changes.

**CAUTION Have two people available to deliver and unpack the Voluson® 730.
Attempts to move the unit considerable distances or on an incline by one person could result in injury or damage or both.**

Section 2-3
Facility Needs

2-3-1 Purchaser Responsibilities

The work and materials needed to prepare the site is the responsibility of the purchaser. Delay, confusion, and waste of manpower can be avoided by completing pre installation work before delivery. Use the Pre installation checklist to verify that all needed steps have been taken. Purchaser responsibility includes:

- Procuring the materials required.
- Completing the preparations before delivery of the ultrasound system.
- Paying the costs for any alterations and modifications not specifically provided in the sales contract.

NOTE: All electrical installations that are preliminary to the positioning of the equipment at the site prepared for the equipment must be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations, and testing must also be performed by qualified personnel. The products involved (and the accompanying electrical installations) are highly sophisticated and special engineering competence is required. All electrical work on these products must comply with the requirements of applicable electrical codes. The purchaser of GE equipment must only utilize qualified personnel to perform electrical servicing on the equipment.

The desire to use a non–listed or customer provided product or to place an approved product further from the system than the interface kit allows presents challenges to the installation team. To avoid delays during installation, such variances should be made known to the individuals or group performing the installation at the earliest possible date (preferably prior to the purchase).

The ultrasound suite must be clean prior to delivery of the machine. Carpet is not recommended because it collects dust and creates static. Potential sources of EMI (electromagnetic interference) should also be investigated before delivery. Dirt, static, and EMI can negatively impact system reliability.

2-3-2 Required Features

NOTE: GE Medical Systems requires a dedicated power and ground for the proper operation of its Ultrasound equipment. This dedicated power shall originate at the last distribution panel before the system. The dedicated line shall consist of one phase, a neutral (not shared with any other circuit), and a full size ground wire from the distribution panel to the Ultrasound outlet. Please note that image artifacts can occur, if at any time within the facility, the ground from the main facility's incoming power source to the Ultrasound unit is only a conduit.

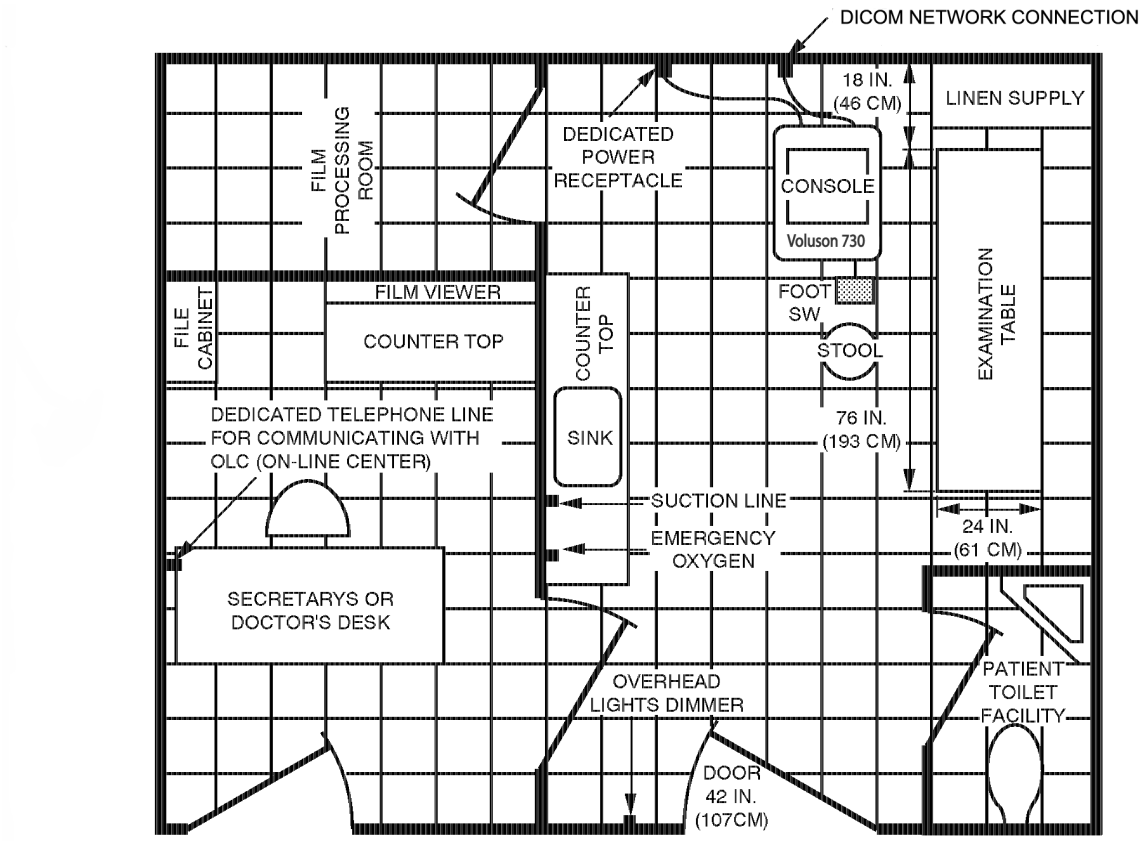
- Door opening is at least 76 cm (30 in) wide.
- Proposed location for unit is at least 0.3 m (1 ft.) from the wall for cooling
- Power outlet and place for any external peripheral are within 2 m (6.5 ft) of each other with peripheral within 1 m of the unit to connect cables.

NOTE: The Voluson® 730 has four outlets inside the unit. One is for the monitor and three for on board peripherals.

2-3-3 Desirable Features

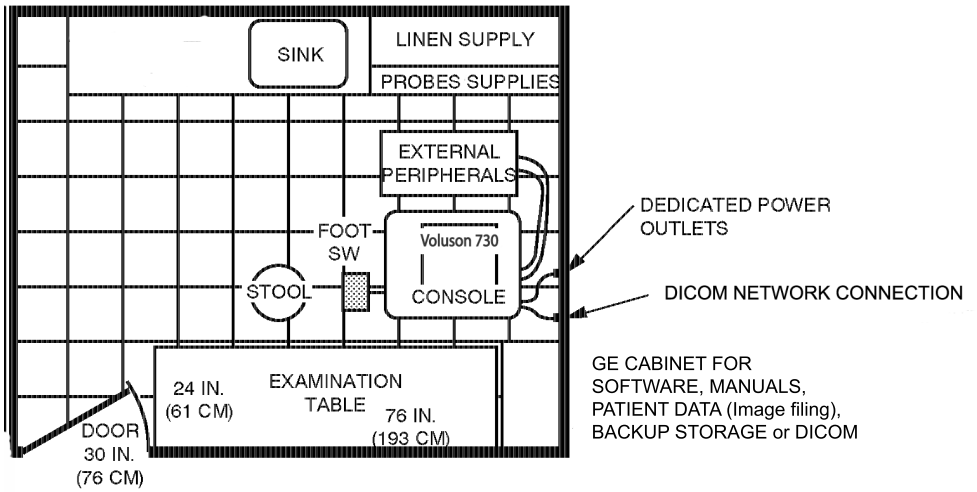
- Door is at least 90 cm (3 ft.) wide
- Circuit breaker for dedicated power outlet is easily accessible
- Sink with hot and cold water
- Receptacle for bio–hazardous waste, like used probe sheaths
- Emergency oxygen supply
- Storage for linens and equipment
- Nearby waiting room, lavatory, and dressing room
- Dual level lighting (bright and dim)
- Lockable cabinet ordered by GE for its software and proprietary manuals

2-3-4 Minimal Floor Plan Suggestion



A 14 by 17 foot Recommended Floor Plan

Scale: Each square equals one square foot



An 8 by 10 foot Minimal Floor Plan

Figure 2-1 Minimal Floor Plan

2-3-5 Networking Pre-installation Requirements

2-3-5-1 Purpose of the DICOM Network Function

DICOM (**D**igital **I**maging and **Co**mmunications in **M**edicine) services provide the operator with clinically useful features for moving images and patient information over a hospital network.
Examples of DICOM services include the transfer of images to workstations for viewing or transferring images to remote printers. As an added benefit, transferring images in this manner frees up the on-board monitor and peripherals, enabling viewing to be done while scanning continues.
With DICOM, images can be archived, stored, and retrieved faster, easier, and at a lower cost.

2-3-5-2 DICOM Option Pre-installation Requirements

To configure the Voluson® 730 to work with other network connections, the site's network administrator must provide some necessary information.

Information must include:

- A Station name, AE Title, IP address and Net Mask for the Voluson® 730.
- The IP addresses for the default gateway and other routers at the site for ROUTING INFORMATION. Only if necessary (e.g. for Internet access).

Installation see: Section 3-8 "Network IP Address Configuration" on page 3-37.

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Chapter 3
Installation

Section 3-1
Overview

3-1-1 The Purpose of Chapter 3

This chapter contains information needed to install the unit. Included are procedures to receive, unpack and configure the equipment.

Table 3-1 Contents in Chapter 3

Section	Description	Page Number
3-1	Overview	3-1
3-2	Receiving and Unpacking the Equipment	3-4
3-3	Preparing for Installation	3-6
3-4	Completing the Installation	3-8
3-5	Printer Installation	3-12
3-6	System Configuration	3-28
3-7	Connectivity Installation Worksheet	3-36
3-8	Network IP Address Configuration	3-37
3-9	Paperwork	3-38

3-1-2 Average Installation Time

Manpower requirement: 2 persons

Table 3-2 Average Installation Time

Description	Average Installation Time	Comments
Unpacking the scanner	0.5 hours	
Scanner /options / printers	0.5 to 1.5 hours	Dependant on the required configuration
DICOM Option	0.5 - 1.5 hours	Dependant on the configuration amount

3-1-3 Installation Warnings

1.) Since the Voluson® 730 weighs approximately 136 kg (300 lb.) without options, preferably two people should unpack it. Two people are also preferable for installing any additional items in excess of 35 pounds (e.g. Monitor).

2.) There are no operator serviceable components. To prevent shock, do not remove any covers or panels. Should problems or malfunctions occur, unplug the power cord. Only qualified service personnel should carry out servicing and troubleshooting.

3.) After being transported, the unit may be very cold or hot. If this is the case, allow the unit to acclimate before you turn it on. It requires one hour for each 2.5°C increment it's temperature is below 10°C or above 40°C.

⚠ **CAUTION** **Equipment damage possibility. Turning the system on without acclimation after arriving at site may cause the system to be damaged.**

Table 3-3 Acclimation Time

°C	60	55	50	45	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40
°F	140	131	122	113	104	96	86	77	68	59	50	41	32	23	14	5	-4	-13	-22	-31	-40
hrs	8	6	4	2	0	0	0	0	0	0	0	2	4	6	8	10	12	14	16	18	20

When pulling, moving or lifting the system, grasp it only at the rear handle of the trolley and the handle underneath the foot rest.

⚠ **WARNING**

Do **NOT** pull or lift the system with the front handle of the user interface (operator panel).

Figure 3-1 pulling, moving or lifting the system

3-1-3-1 Brake Pedal Operation

⚠ **WARNING** ***REMEMBER: If the front wheels are engaged for transportation, pressing the release brake pedals (brakes on front wheels under the foot rest) once disengages the lock.***

3-1-3-2 Operator I/O Panel Position

If weight is placed on the Operator I/O Panel in it's extended position the console could tip over.

⚠ **WARNING** ***The system should NOT be moved with the Operator I/O Panel extended. Move the Operator I/O Panel to it's centered and locked position.***

⚠ **WARNING** ***Monitor mounting mechanism may break if not properly supported (e.g. with packing foam) during transportation even inside the hospital.***

3-1-4 Safety Reminders

DANGER **WHEN USING ANY TEST INSTRUMENT THAT IS CAPABLE OF OPENING THE AC GROUND LINE (I.E., METER'S GROUND SWITCH IS OPEN), DON'T TOUCH THE UNIT!**

CAUTION **Two people should unpack the unit because of its weight. Two people are required whenever a part weighing 16kg (35 lb.) or more must be lifted.**

CAUTION **If the unit is very cold or hot, do not turn on its power until it has had a chance to acclimate to its operating environment.**

CAUTION **To prevent electrical shock, connect the unit to a properly grounded power outlet. Do not use a three to two prong adapter. This defeats safety grounding.**

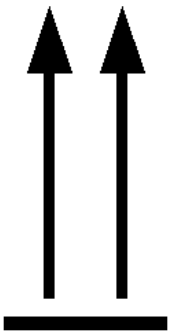
CAUTION **Do NOT wear the ESD wrist strap when you work on live circuits and more than 30 V peak is present.**

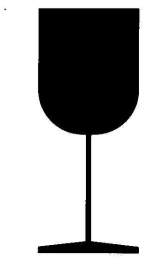
CAUTION **Do not use a20 Amp to 15 Amp adapter on the 120 Vac unit's power cord. This unit requires a dedicated 16 A circuit.**

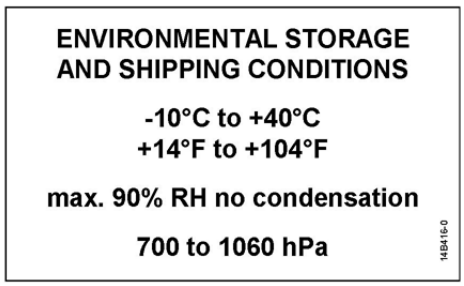
CAUTION **Do not operate this unit unless all board covers and frame panels are securely in place. System performance and cooling require this.**

CAUTION **OPERATOR MANUAL(S)**
The User Manual(s) should be fully read and understood before operating the Voluson® 730 and kept near the unit for quick reference.

CAUTION **ACOUSTIC OUTPUT HAZARD**
Although the ultrasound energy transmitted from the Voluson® 730 probe is within FDA limits, avoid unnecessary exposure. Ultrasound energy can produce heat and mechanical damage.







10 VERLAG J.A. KITZLER, 1011 Wien, Uraniastr. 4, Tel.: 01/713 53 34, Fax.: 01/715 57 84-85 12 VERLAG J.A. KITZLER, 1011 Wien, Uraniastr. 4, Tel.: 01/713 53 34, Fax.: 01/715 57 84-85

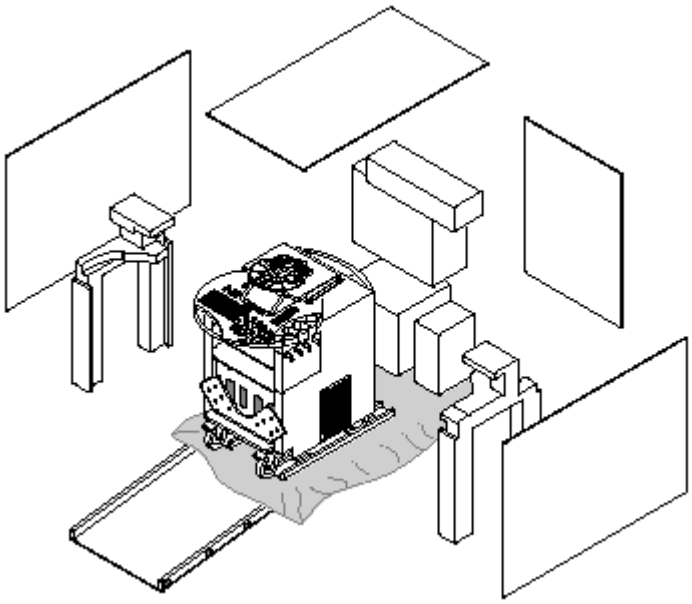
Figure 3-2 Environmental Labels

Section 3-2
Receiving and Unpacking the Equipment

CAUTION

Transport only with forklift or stracker truck.
During transport pay attention to the point of gravity!

Have two people available to unpack the Voluson® 730.
Attempts to move the unit considerable distances or on an incline by one person could result in injury or damage or both.



Check whether delivery is complete (according to delivery note) and check visual damage!

Unpack the devices such a way that packaging can be reused.

The device must only be transported in the original packaging.

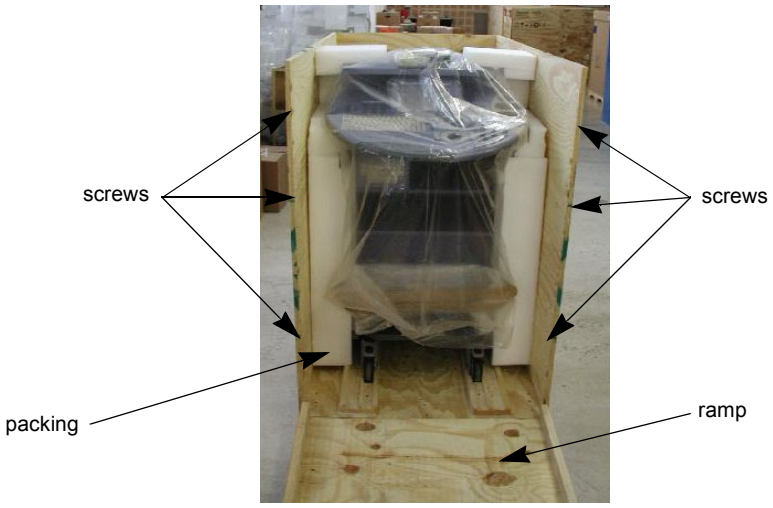
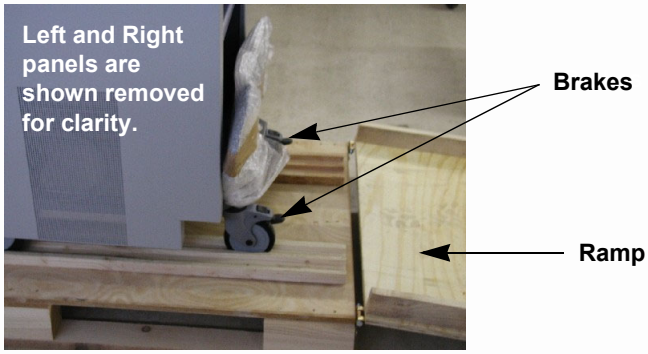
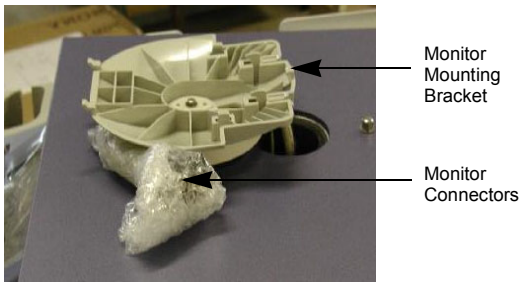
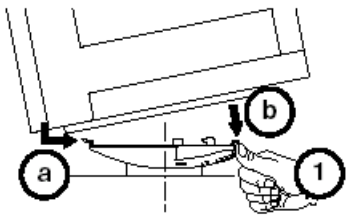
A drill with size 20 torx bit and/or medium cross point bit will be needed to open the crate.

Figure 3-3 Unpacking the system

Table 3-4 Unpacking Procedure

Step	Task
1.	Loosen the screws and remove top panel from crater

Table 3-4 Unpacking Procedure

Step	Task
2.	Open front panel (ramp) by removing the screws from the side panels. Lower ramp. 
3.	Carefully remove foam packing material, plastic bag from ultrasound unit and the monitor and any other item from the wooden box.
Caution: Two people are needed in the next step due to the weight of the equipment.	
4.	Disengage the brakes and slowly move unit down the ramp 
Note: Packing crate and material should be stored for future use.	
5.	Remove Monitor from its box and mount it on the system.   **1. Attach Monitor** **a)** Insert **b)** Press the Monitor Mounting Bracket to engage (to hear a “click”). Check if the monitor is fixed correct.

Section 3-3
Preparing for Installation

3-3-1 Connection of Auxiliary Devices

3-3-1-1 Monitor Connection

1.) Connect all the Monitor cables a shown in Figure 3-4.
2.) Mount connector protection at the monitor cables.
3.) Activate the power switch on the rear side of the monitor.

NOTE: The switch of the monitor has to be in ON position before starting the system. Leave monitor power switch always ON.

Figure 3-4 Monitor Connection

3-3-1-2 Connection of Peripherals

1.) Remove rear cover plate. see Figure 3-5
- Carefully remove plastic caps using a slotted screwdriver or the blade of a knife.
- Loosen screws and washers.

2.) When the cover is loose on top, pull the rear cover out and move upwards.

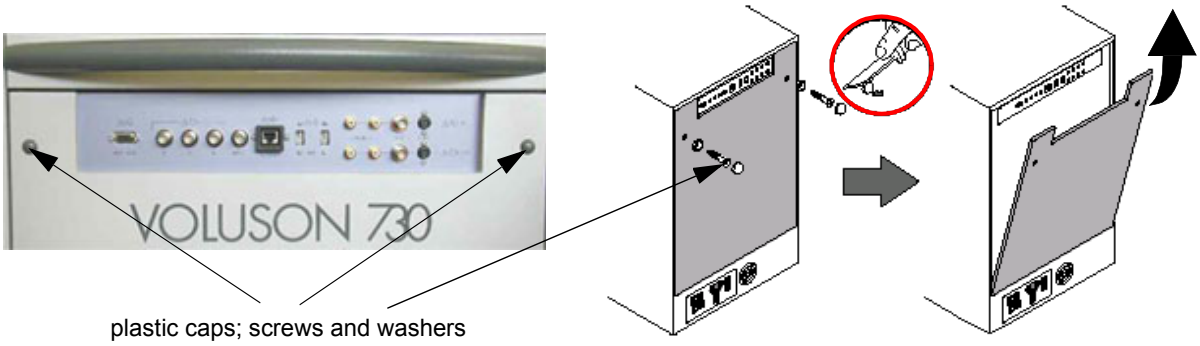


Figure 3-5 Remove rear cover plate

3.) Disconnect the GND ground-cable from the back of the rear cover plate.

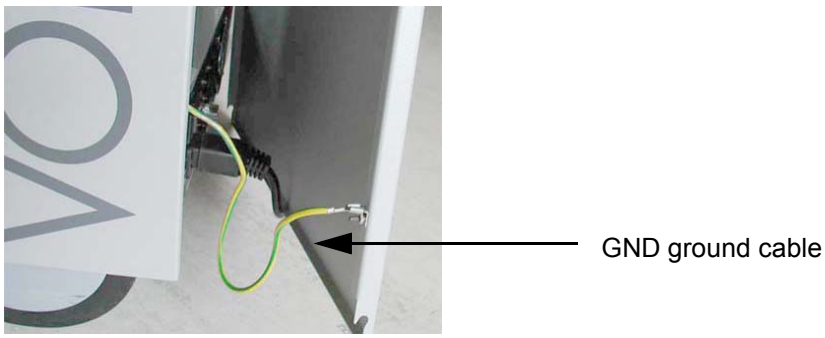


Figure 3-6 GND ground-cable

4.) Connect all Peripherals.

For connection schemes of Peripherals refer to Chapter 20 in the Basic User Manual of Voluson® 730.

5.) Connect the GND ground-cable at the rear cover plate.

6.) Mount rear cover plate.

- Reattach screw and washers.
- Plug-in caps.

3-3-2 Verify Customer Order

Compare items received by the customer to that which is listed on the delivery order. Report any items that are missing, back ordered or damaged.

3-3-3 Physical Inspection

3-3-3-1 System Voltage Settings

Verify that the scanner is set to the correct voltage.
The Voltage settings for the Voluson® 730 Scanner is found on a metal plate, on the rear of the system.

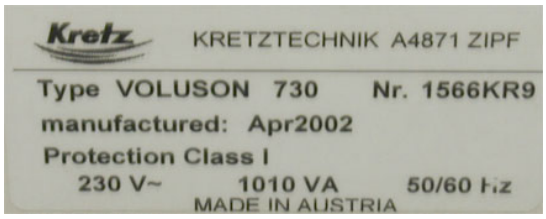


Figure 3-7 Identification Plate Example

⚠ **WARNING** ***CONNECTING A Voluson® 730 SCANNER TO THE WRONG VOLTAGE LEVEL WILL MOST LIKELY DESTROY THE SCANNER.***

3-3-4 EMI Protection

This unit has been designed to minimize the effects of Electo-Magnetic Interference (EMI). Many of the covers, shields, and screws are provided primarily to protect the system from image artifacts caused by this interference. For this reason, it is imperative that all covers and hardware are installed and secured before the unit is put into operation.

Section 3-4
Completing the Installation

3-4-1 System Specifications

3-4-1-1 Physical Dimensions of Voluson® 730

The physical dimensions of the Voluson® 730 unit are summarized in Table 3-5.
Table 3-6 lists the size of Voluson® 730, with monitor and without on-board peripherals.

Table 3-5 Physical Dimensions of Voluson® 730

Height	Width	Depth
145 cm / 57.1 inches	68 cm / 26.8 inches	100 cm / 39.4 inches

3-4-1-2 Weight without Monitor and Peripherals

Table 3-6 Weight of Voluson® 730 With Monitor and Without Other Peripherals

Model	Weight [kg]	Weight [lbs.]
Voluson® 730	136	300

3-4-1-3 Acoustic Noise Output

max. 57dB(A)

3-4-2 Electrical Specifications

Table 3-7 Electrical Specifications for Voluson® 730

Voltage	Tolerances	Current	Frequency
100 VAC	±10%	10.10 A	50, 60 Hz (±2%)
115 VAC	±10%	8.80 A	50, 60 Hz (±2%)
130 VAC	±10%	7.80 A	50, 60 Hz (±2%)
230 VAC	±10%	4.40 A	50, 60 Hz (±2%)
240 VAC	±10%	4.20 A	50, 60 Hz (±2%)

Power Consumption nominal 1010 VA including all options.

Mains outlets: Mains socket ST1, ST2, ST3, ST4, ST5 for accessories.
All mains outlets are co-switched by the unit's mains switch via built-in isolation transformer.
Output voltage for: ST1 - ST5: 115V or 230V.

CAUTION **Modification of voltage setting only by an authorized service person! Output power: 350VA per mains outlet, max. power of all connected accessories must not exceed 350VA.**

3-4-3 Power On / Boot Up

3-4-3-1 Scanner Power On

1.) Connect the Power Cable to the back of the system.
2.) Connect the Main Power Cable to a hospital grade power receptacle with the proper rated voltage. Never use an adapter that would defeat the safety ground.
3.) Switch ON the Circuit Breaker and the Power Switch of peripherals at the rear of the system.

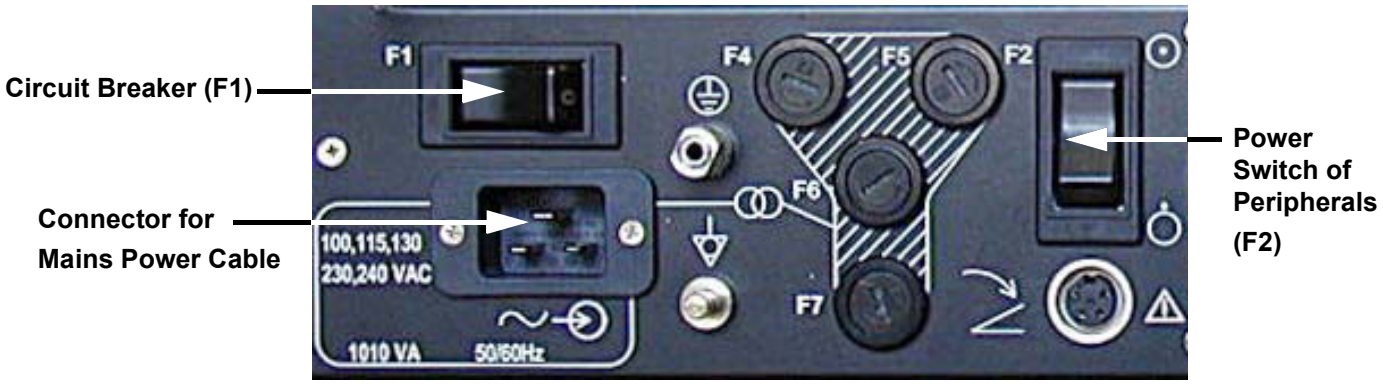


Figure 3-8 Circuit Breaker (F1) and Power Switch of Peripherals (F2)

⚠ **NOTICE** When AC power is applied to the scanner, the **ON/OFF** switch on the Control panel is illuminated, indicating that the System (including the Back-end Processor) is in standby mode.

3-4-3-2 Back-end Processor Boot Up

Press the **ON/OFF** Stand-By switch left belowthe Control Panel once.

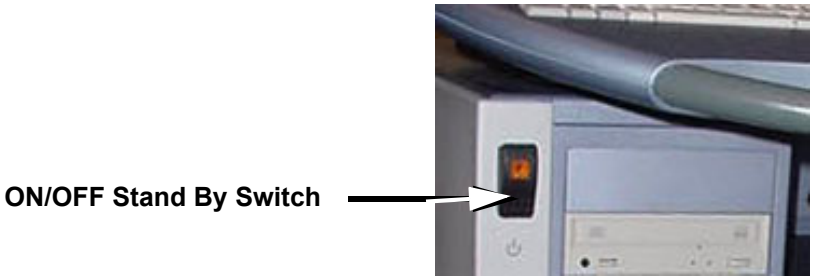


Figure 3-9 ON/OFF Stand-By Switch

When the **ON/OFF** Stand-By switch left below the Control Panel is pressed once, the System (including the Back-end Processor) starts and the software code is distributed to initiate the scanner.

The company logo appears on the Touch screen during boot up.
Depending on the BIOS-Version no status messages are displayed during this process.
Boot up time is about 3 minutes.

*NOTE: The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the Stand-By switch. The switch of printers has to be in ON position before starting the system. So the auxiliary equipment need not to be switched ON/OFF separately if the **F2** power switch on the back of the system and the switches of the peripherals are always ON.*

3-4-4 Power Off/ Shutdown

NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

3-4-4-1 Back-end Processor Power Down

1.) Press the **ON/OFF** Stand-By switch left below the Control Panel once. Figure 3-9

3-4-4-2 Scanner Shutdown

1.) Press the **ON/OFF** Stand-By switch left below the Control Panel once.
2.) Switch OFF the Circuit Breaker at the rear of the system.

NOTE: The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the Standby switch. So the auxiliary equipment need not to be switched ON/OFF separately.

3.) Disconnect the Mains Power Cable if necessary. *For example:* Repairing the system.

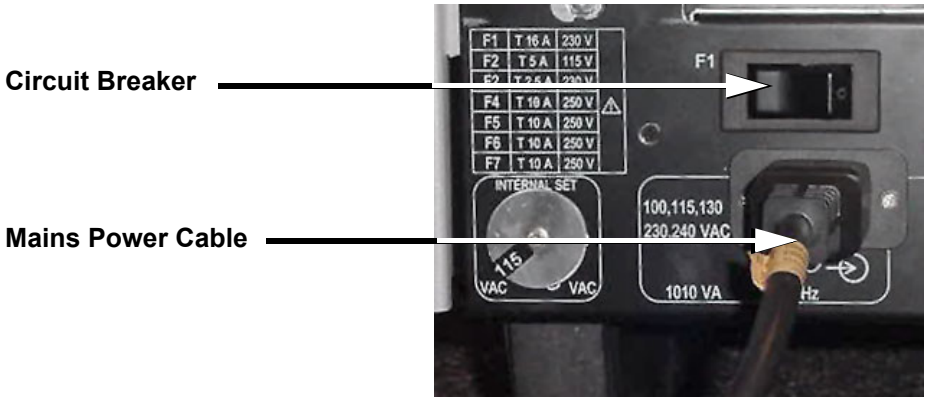


Figure 3-10 Circuit Breaker and Power Cable on Back of Voluson® 730

4.) Press once on the brakes to block the front wheels (brakes on front wheels under the foot rest).
5.) Prior to disconnect a probe freeze the image.
6.) Open the right-hand side door, remove the probe cable from the cable holder and close the door.
7.) Move the probe locking handle counterclockwise. Pull the connector straight out of the probe port.

⚠ **CAUTION** **If a probe is disconnected while running (Write-Mode) a software error may occur. In this case switch the unit OFF (perform a reset).**

3-4-5 Transducer Connection

NOTE: Prior to connecting or disconnecting a probe, freeze the image.
It is not necessary to turn OFF power to connect or disconnect a transducer.

Connect a transducer to one of the three rightmost transducer receptacle as follows:

1.) Ensure that the transducer twist lock lever is at horizontal position.
2.) Insert the transducer connector on the receptacle guide pin until it touches the receptacle mating surface.
3.) Twist the transducer twist lock lever to vertical position to lock it in place. Twist the lever to the horizontal position to disconnect the transducer.
4.) Open the right-hand side door, lay the cable into the intended cable holder and close the door.

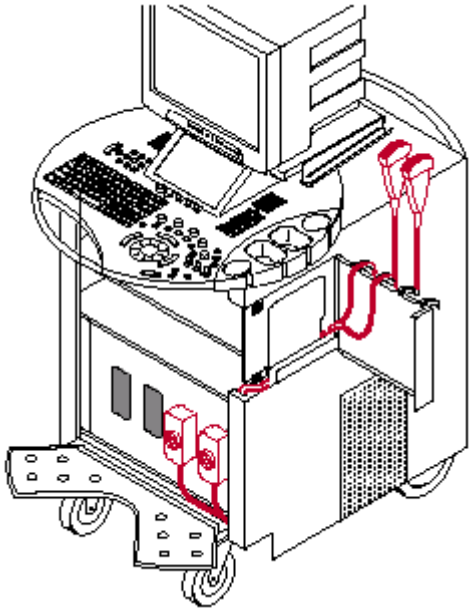


Figure 3-11 Transducer Connection

⚠ **CAUTION** **If the cable spout on the right-hand door is missing, don't pull the probe cable. Please insert the spout in the designated place to avoid damage of the probe cable.**

Section 3-5
Printer Installation

3-5-1 Installing Line Printer HP 990cxi or HP 995c

For connection schemes of Peripherals refer to Chapter 20 in the Basic User Manual of Voluson® 730.

NOTE: "Mouse functions" can be performed by using the trackball for moving the cursor. "Normal select" (Click) by pressing the left or right trackball keys and for "opening a context menu" press the upper trackball key.

1.) Turn ON the system, and wait till the system has booted.

2.) Prepare the color printer as illustrated at HP quick start poster "Windows quick start":

- Attach Automatic Two–Side Printing Module and load white paper
- Plug in power cord **(Do NOT turn ON the printer!!!)**
- **Turn on the printer** and install print cartridges, after closing the top cover a calibration page is printed automatically.

3-5-1-1 Install the HP printer software/driver

Perform the following steps if this printer was never installed on the Voluson® 730!

3.) Connect the USB cable to the printer and the system. The windows 'Searching for Drivers …', 'Found new Hardware …' and finally the following windows appear.

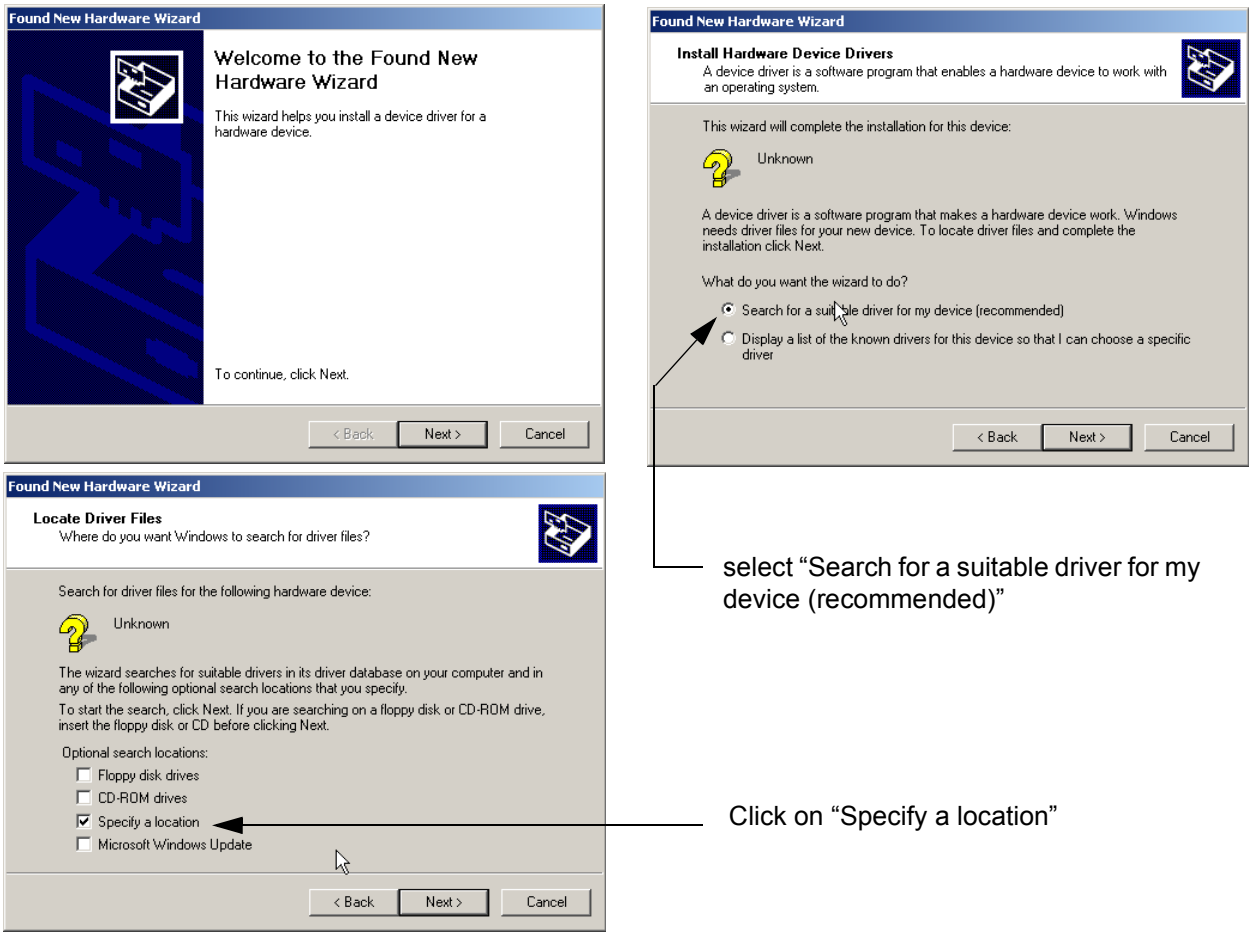

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install a device driver for a hardware device.
To continue, click Next.
< Back
Next >
Cancel
Found New Hardware Wizard
Install Hardware Device Drivers
A device driver is a software program that enables a hardware device to work with an operating system.
This wizard will complete the installation for this device:
Unknown
A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.
What do you want the wizard to do?
Search for a suitable driver for my device (recommended)
Display a list of the known drivers for this device so that I can choose a specific driver
< Back
Next >
Cancel
select "Search for a suitable driver for my device (recommended)"
Found New Hardware Wizard
Locate Driver Files
Where do you want Windows to search for driver files?
Search for driver files for the following hardware device:
Unknown
The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.
To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.
Optional search locations:
Floppy disk drives
CD-ROM drives
Specify a location
Microsoft Windows Update
< Back
Next >
Cancel
Click on "Specify a location"

Figure 3-12 Found New Hardware Wizard

3-5-1-1 Install the HP printer software/driver (cont'd)

4.) Click the NEXT buttons to start the Hardware Wizard and to locate the driver files.

5.) Use the BROWSE button to search the following path on the hard disk (see: Figure 3-13)

- **C:\Utilities\PrinterDriver\HPDeskjet990c** for HP 990cxi
- **C:\Utilities\PrinterDriver\HPDeskjet995c** for HP 995c, and then click OK.

*NOTE: If no drivers can be found on the hard disk (C:\…) for HP995c , use the HP-Installation disk and browse for the file **HPF995K.INF**. Path: **F: \DEU\DRIVERS\WIN2K_XP.***

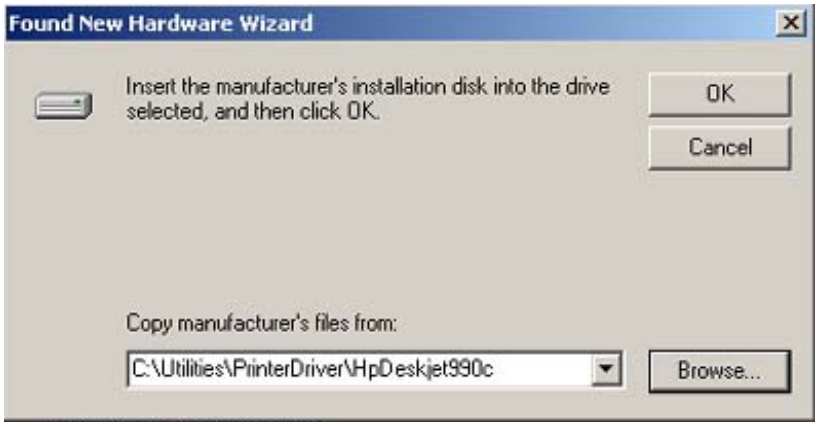


Figure 3-13 Search for Network path

6.) Confirm the correct path and click NEXT to install the driver. All necessary files are copied.

7.) Confirm the installation by clicking FINISH to close the Hardware Wizard.

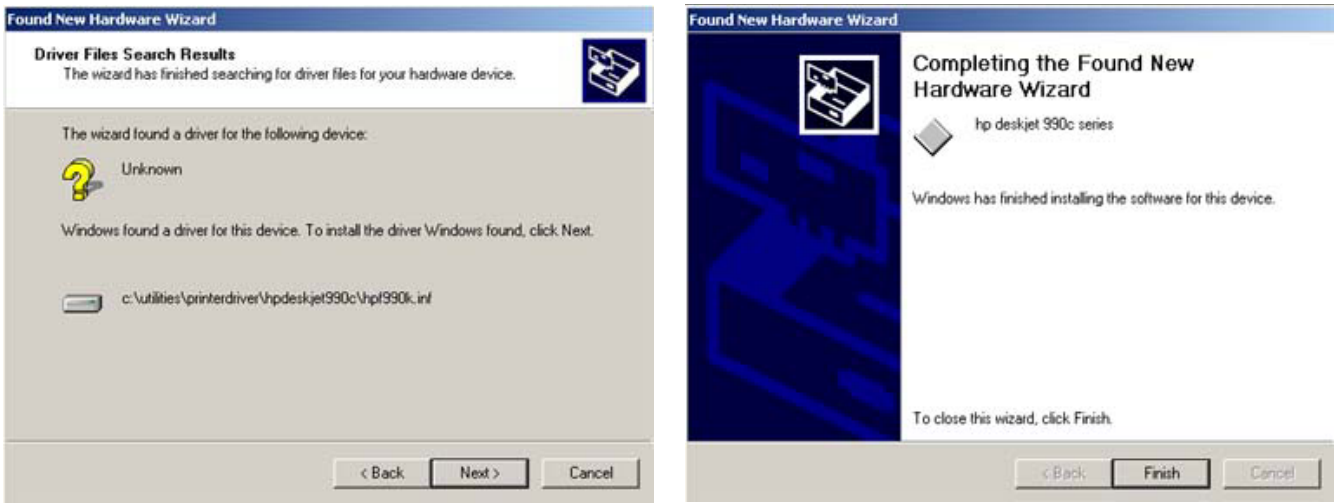

Found New Hardware Wizard
Driver Files Search Results
The wizard has finished searching for driver files for your hardware device.
The wizard found a driver for the following device:
Unknown
Windows found a driver for this device. To install the driver Windows found, click Next.
c:\utilities\printerdriver\hpdeskjet990c\hpf990k.inf
< Back
Next >
Cancel
Found New Hardware Wizard
Completing the Found New Hardware Wizard
hp deskjet 990c series
Windows has finished installing the software for this device.
To close this wizard, click Finish.
< Back
Finish
Cancel

Figure 3-14 Confirm correct path and finish the Installation

8.) Close all open windows, close the "System Setup" with SAVE & EXIT and restart the system (turn off and on the system).

NOTICE After boot up of the system, verify the correct settings in the printer "Properties", see: Section 3-5-5 "Adjustment of Printer Settings" on page 3-23.

3-5-2 Installing Digital Color Printer Sony UP-D21MD

1.) Power off/Shutdown the system as described in: Section 3-4-4 on page 3-10.

2.) Connect the printer as described in: Section 3-3-1-2 on page 3-6 and reinstall the rear cover plate.

NOTE: For connection schemes refer to Chapter 20 in the Basic User Manual for Voluson® 730.

⚠ **NOTICE** Do not connect the USB-cable to the printer!

NOTE: "Mouse functions" can be performed by using the trackball for moving the cursor. "Normal select" (Click) by pressing the left or right trackball keys and for "opening a context menu" press the upper trackball key.

3.) Turn ON the printer, then switch ON the power of the system and wait till the system has booted.

NOTE: The power switch of the printer has to be in ON position before starting the system!

3-5-2-1 Install the UP-D21MD printer software/driver

Perform the following steps if this printer was never installed on the Voluson® 730!

4.) Connect the USB cable to the printer and the system. The windows 'Searching for Drivers …', 'Found new Hardware …' and finally the following windows appear.

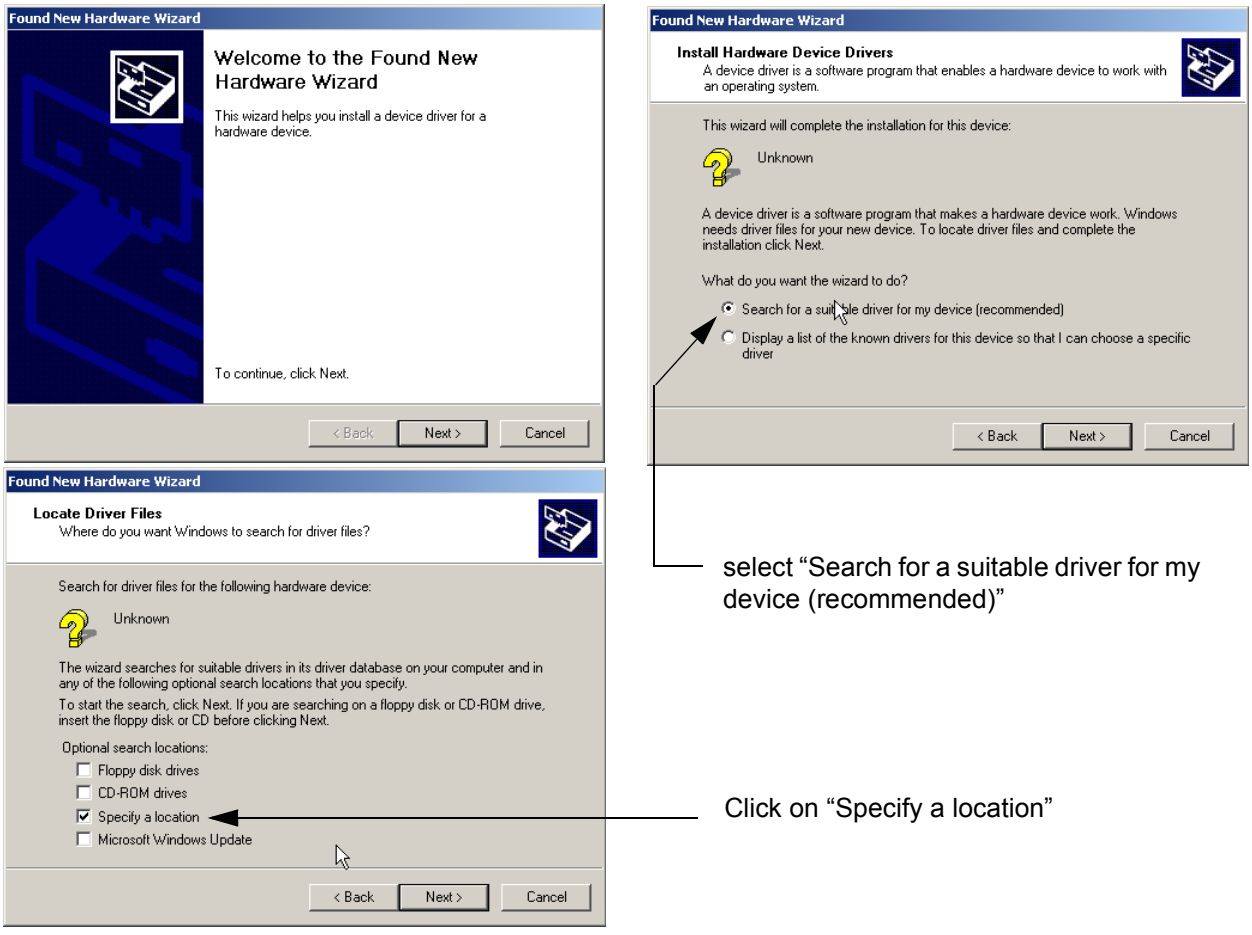

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install a device driver for a hardware device.
To continue, click Next.
< Back
Next >
Cancel
Found New Hardware Wizard
Install Hardware Device Drivers
A device driver is a software program that enables a hardware device to work with an operating system.
This wizard will complete the installation for this device:
Unknown
A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.
What do you want the wizard to do?
Search for a suitable driver for my device (recommended)
Display a list of the known drivers for this device so that I can choose a specific driver
< Back
Next >
Cancel
select "Search for a suitable driver for my device (recommended)"
Found New Hardware Wizard
Locate Driver Files
Where do you want Windows to search for driver files?
Search for driver files for the following hardware device:
Unknown
The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.
To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.
Optional search locations:
Floppy disk drives
CD-ROM drives
Specify a location
Microsoft Windows Update
< Back
Next >
Cancel
Click on "Specify a location"

Figure 3-15 Found New Hardware Wizard

5.) Click the NEXT buttons to start the Hardware Wizard and to locate the driver files.

3-5-2-1 Install the UP-D21MD printer software/driver (cont'd)

6.) Use the BROWSE button to search the following path **C:\Utilities\PrinterDriver\SonyUP-D21MD** see: Figure 3-13and then click OK.

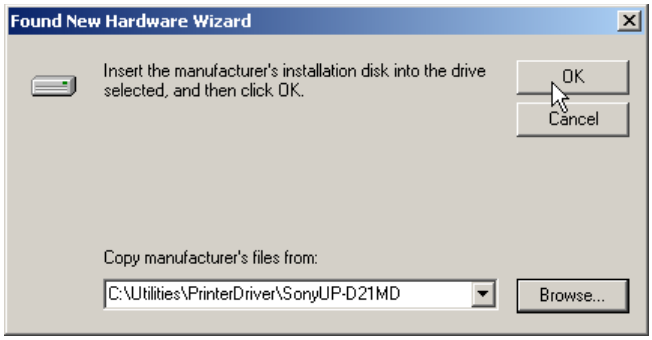


Figure 3-16 Search for Network path

7.) Confirm the correct path and click NEXT to install the driver. All necessary files are copied.

8.) The Message: **Digital Signature Not Found appears**. Click YES.

9.) Confirm the installation by clicking FINISH to close the Hardware Wizard.

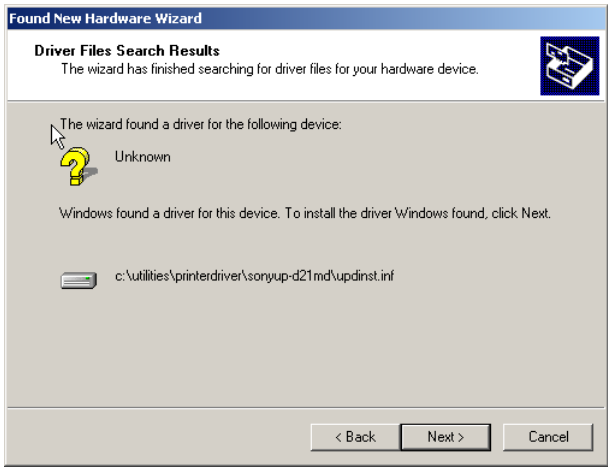

Found New Hardware Wizard
Driver Files Search Results
The wizard has finished searching for driver files for your hardware device.
The wizard found a driver for the following device:
Unknown
Windows found a driver for this device. To install the driver Windows found, click Next.
c:\utilities\printerdriver\sonyup-d21md\updinst.inf
< Back
Next >
Cancel

Figure 3-17 Confirm correct path and finish the Installation

10.) Close all open windows, close the "System Setup" with SAVE & EXIT and restart the system (turn off and on the system).

NOTICE After boot up of the system, verify the correct settings in the printer "Properties", see: Section 3-5-5 "Adjustment of Printer Settings" on page 3-23.

3-5-3 Installing Digital Color Printer (Sony UP-D2600S or Mitsubishi CP770DW)

1.) Power off/Shutdown the system as described in: Section 3-4-4 on page 3-10.

2.) Remove the rear cover plate as described in: Section 3-3-1-2 on page 3-6.

3.) Remove SCSI-Adapter.

⚠ **NOTICE** **If only one single SCSI-cable is connected between Main Module and GEM (Drive Module):**
Disconnect the SCSI connector from the main module (PC-part) and connect it to the SCSI-printer. Connect the additional SCSI-cable (included in PZP50 connection set) from the main module to the SCSI-printer.

4.) Feed the SCSI-cables through the holes of the system housing to the front side where the printer will be placed and connect them to the printer.

5.) Feed the Power cable to the backside and connect it on the Voluson® 730 power supply.

NOTE: For connection schemes refer to Chapter 20 in the Basic User Manual of Voluson® 730.

6.) Reinstall the rear cover plate.

⚠ **NOTICE** Do not insert more SCSI-cables than required; the SCSI-cable length should be as short as possible!

NOTE: "Mouse functions" can be performed by using the trackball for moving the cursor. "Normal select" (Click) by pressing the left or right trackball keys and for "opening a context menu" press the upper trackball key.

7.) Turn ON the printer.

8.) Switch ON the power of the system and wait till the system has booted.

NOTE: The power switch of the printer has to be in ON position before starting the system! Leave the power switch of the printer always in the ON position.

9.) Follow the printer installation steps as described in Section 3-5-4 "Printer Installation manually" on page 3-17.

3-5-4 Printer Installation manually

1.) On the Touch Panel, press UTILITIES.
2.) In the Utilities menu, touch SYSTEM SETUP to invoke the setup desktop on the screen.
3.) Select the SERVICE page. The “password window” appears automatically.

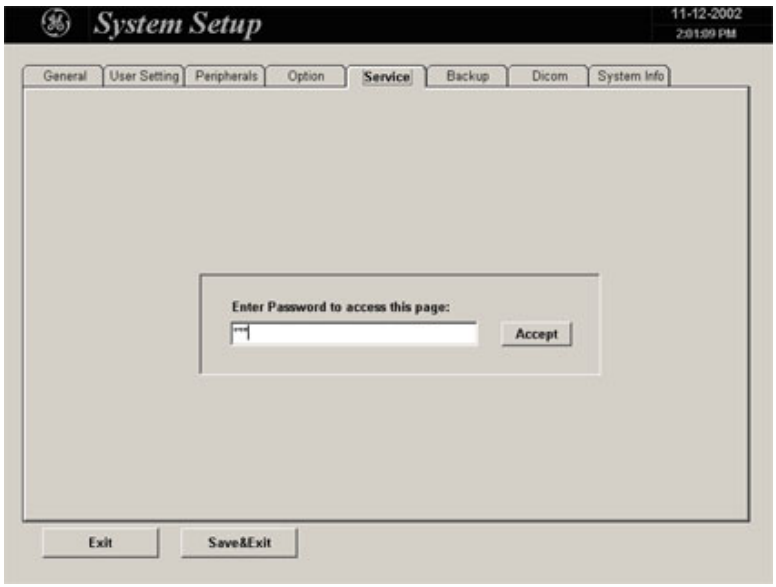


Figure 3-18 System Setup Service page

4.) Enter the password SHE and click the ACCEPT button to display the Service Tools window.

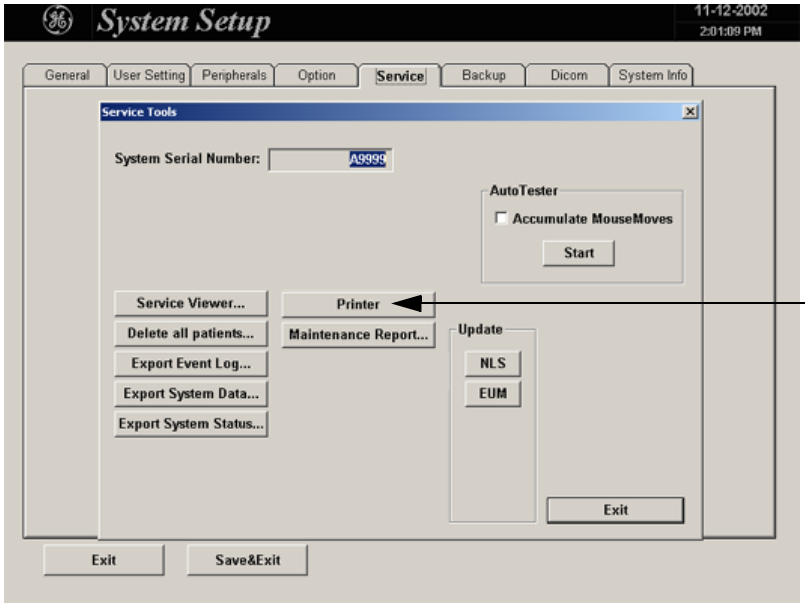


Figure 3-19 Service Tools window

5.) Click on the PRINTER button.

3-5-4 Printer Installation manually (cont'd)

6.) Click the ADD PRINTER button.

A warning message appears:
Please read this message carefully and click YES if you have skills to do this.

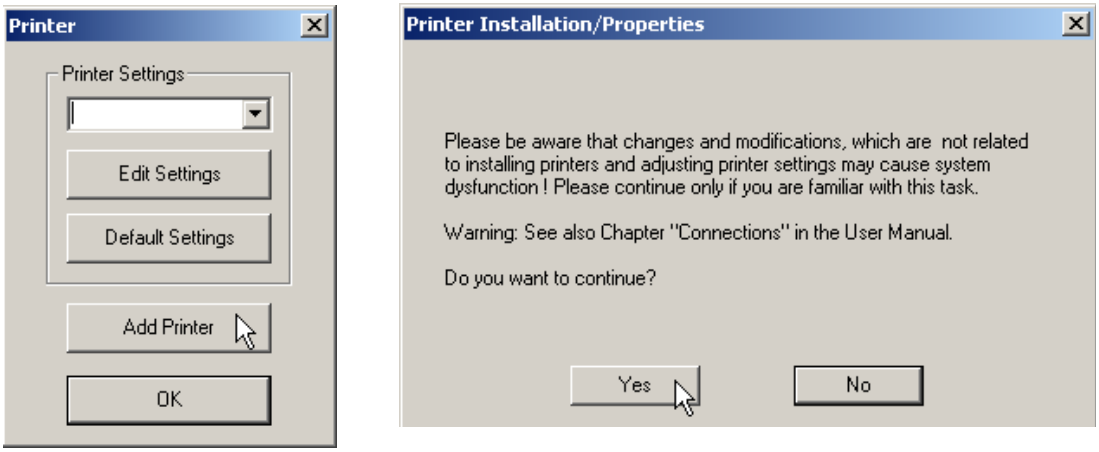

Printer
Printer Settings
Edit Settings
Default Settings
Add Printer
OK
Printer Installation/Properties
Please be aware that changes and modifications, which are not related to installing printers and adjusting printer settings may cause system dysfunction ! Please continue only if you are familiar with this task.
Warning: See also Chapter "Connections" in the User Manual.
Do you want to continue?
Yes
No

Figure 3-20 Printer Installation / Properties

⚠ **NOTICE** At older Software versions, first the warning message appears.
After confirming with the YES button, click the ADD PRINTER icon on the displayed screen.

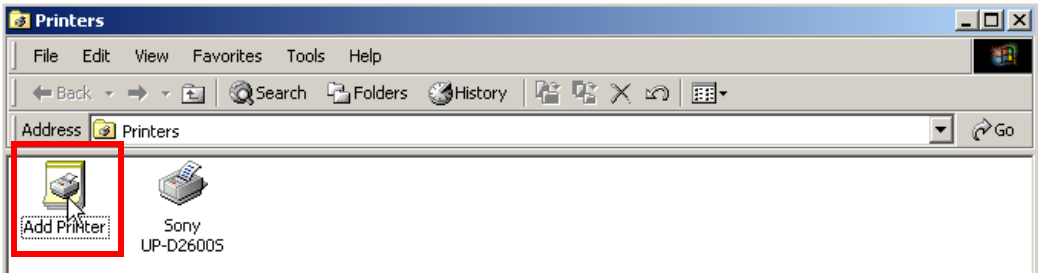


Figure 3-21 Add Printer

3-5-4 Printer Installation manually (cont'd)

7.) Click the NEXT button to start the Add Printer Wizard.

8.) Select the 'Local Printer' , deselect "Automatically install Plug and Play printer" and then click NEXT.

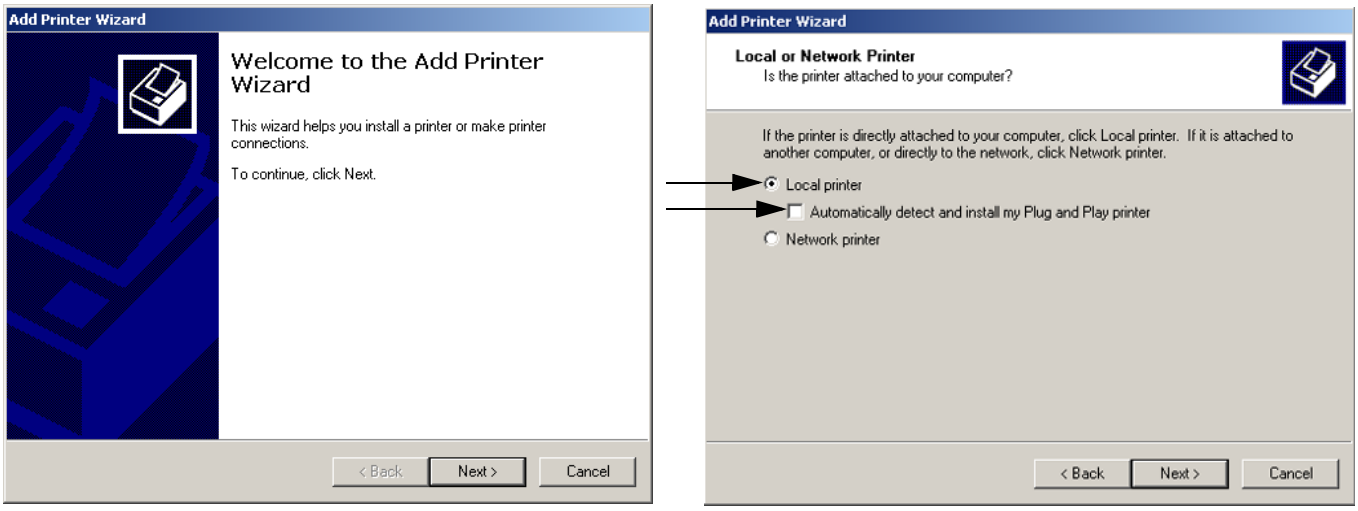

Add Printer Wizard
Welcome to the Add Printer Wizard
This wizard helps you install a printer or make printer connections.
To continue, click Next.
< Back
Next >
Cancel
Add Printer Wizard
Local or Network Printer
Is the printer attached to your computer?
If the printer is directly attached to your computer, click Local printer. If it is attached to another computer, or directly to the network, click Network printer.
Local printer
Automatically detect and install my Plug and Play printer
Network printer
< Back
Next >
Cancel

Figure 3-22 Add Printer Wizard

9.) Select the corresponding Printer Port (e.g., Figure 3-23 Sony UP-D21MD = USB002) and click NEXT.

CAUTION **If you have to install the SCSI-Printer UP-D2600S or the SCSI-Printer CP770DW for the first time, the correct port may not be listed.**

In this case, select any port and finish the installation procedure. After restart of the system, adjust the port selection in the printer "Properties"; see: Section 3-5-5 on page 3-23.

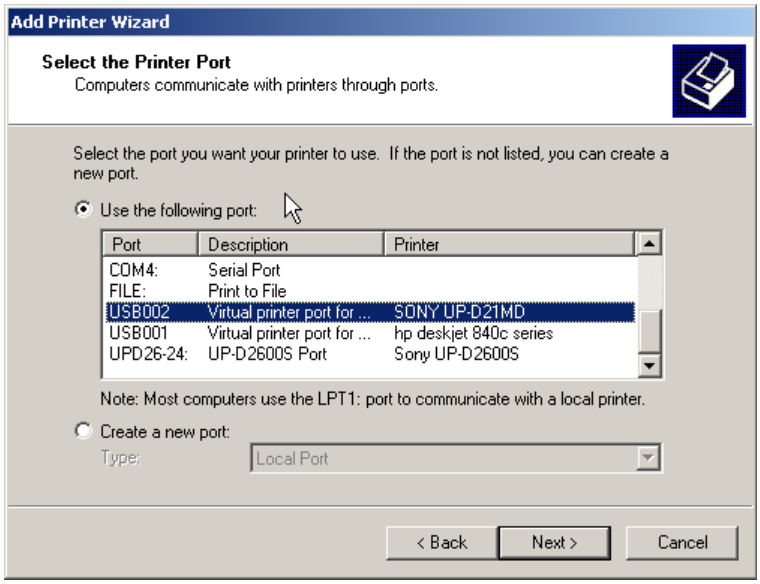

Add Printer Wizard
Select the Printer Port
Computers communicate with printers through ports.
Select the port you want your printer to use. If the port is not listed, you can create a new port.
Use the following port:
Port Description Printer
COM4: Serial Port
FILE: Print to File
USB002 Virtual printer port for ... SONY UP-D21MD
USB001 Virtual printer port for ... hp deskjet 840c series
UPD26-24: UP-D2600S Port Sony UP-D2600S
Note: Most computers use the LPT1: port to communicate with a local printer.
Create a new port:
Type:
Local Port
< Back
Next >
Cancel

Figure 3-23 Select Printer Port

3-5-4 Printer Installation manually (cont'd)

10.) In the following window select the HAVE DISK button.

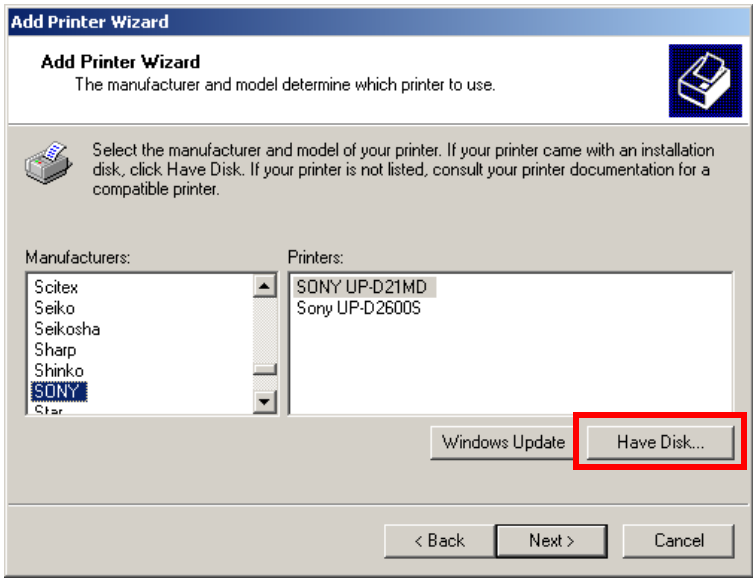


Figure 3-24 Have Disk...

11.) Use the BROWSE button to search the Printer Driver path.

- for Line Printer HP 990cxi **C:\Utilities\PrinterDriver\HPDeskjet990c**
- for Line Printer HP 995c **C:\Utilities\PrinterDriver\HPDeskjet995c**
- for Color Printer UP-D21MD **C:\Utilities\PrinterDriver\SonyUP-D21MD**
- for SCSI-Printer UP-D2600S **C:\Utilities\PrinterDriver\SonyUP-D2600S**
- for SCSI-Printer CP770DW **C:\Utilities\PrinterDriver\MitsubishiCP770DW**

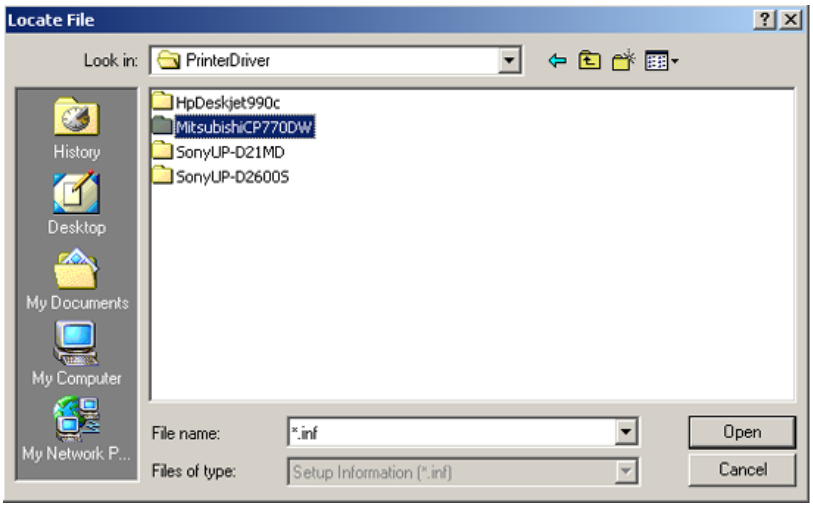


Figure 3-25 Select Printer Driver path (C:\Utilities\PrinterDriver\....)

*NOTE: If no drivers can be found on the hard disk (C:\...) for HP995c , use the HP-Installation disk and browse for the file **HPF995K.INF**. Path: **F: \DEU\DRIVERS\WIN2K_XP***

3-5-4 Printer Installation manually (cont'd)

12.) Verify the selected Printer Driver path and confirm with OK.

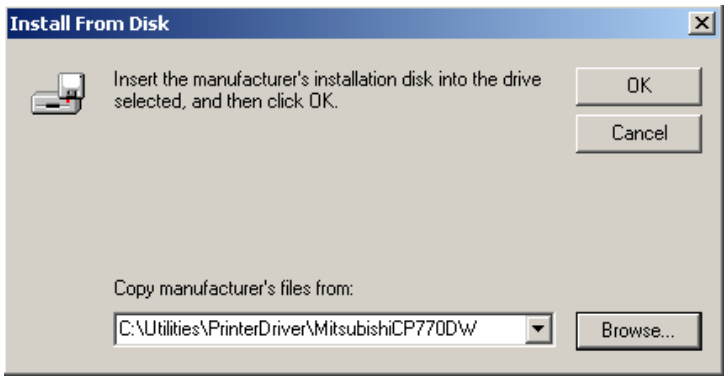


Figure 3-26 verify selected Printer Driver path

13.) Select the manufacturer and model of your printer and confirm with the NEXT button.

14.) Assign a name, decide if the printer should be used as default printer and confirm with NEXT. see: Figure 3-27.

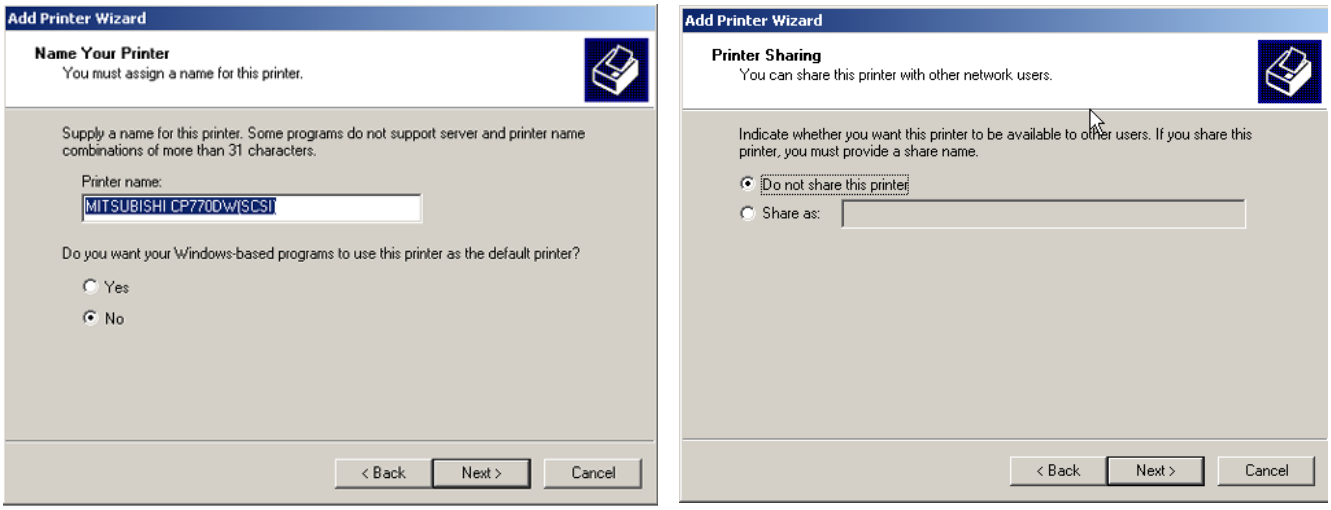

Add Printer Wizard
Name Your Printer
You must assign a name for this printer.
Supply a name for this printer. Some programs do not support server and printer name combinations of more than 31 characters.
Printer name:
MITSUBISHI CP770DW(SCSI
Do you want your Windows-based programs to use this printer as the default printer?
Yes
No
< Back
Next >
Cancel
Add Printer Wizard
Printer Sharing
You can share this printer with other network users.
Indicate whether you want this printer to be available to other users. If you share this printer, you must provide a share name.
Do not share this printer
Share as:
< Back
Next >
Cancel

Figure 3-27 Assign name and select Printer Sharing - no

15.) Select 'Do not share this printer' and confirm the "Printer Sharing" window (Figure 3-27) by clicking NEXT.

3-5-4 Printer Installation manually (cont'd)

16.) The "Complete the Add Printer Wizard" window appears on the screen.

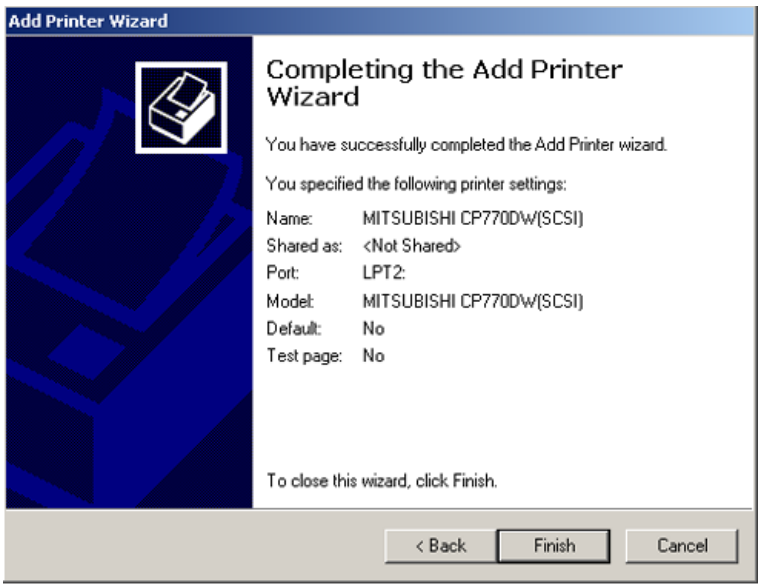


Figure 3-28 Complete manual Printer Installation

17.) Complete the manual Printer Installation with the FINISH button.

18.) Close all open windows, close the "System Setup" with SAVE & EXIT and restart the system (turn off and on the system).

NOTICE After boot up of the system, verify the correct settings in the printer "Properties", see: Section 3-5-5 "Adjustment of Printer Settings" on page 3-23.

3-5-5 Adjustment of Printer Settings

1.) After system restart, touch the UTILITIES key, and then SYSTEM SETUP on the Touch Panel.
2.) Select the SERVICE page, enter the password SHE and click the ACCEPT button.
3.) Click on the PRINTER button.
4.) Select the desired printer from the pull-down menu and click the EDIT SETTINGS button.
5.) Confirm the warning message with the YES button. The **"Printer Properties"** appear.

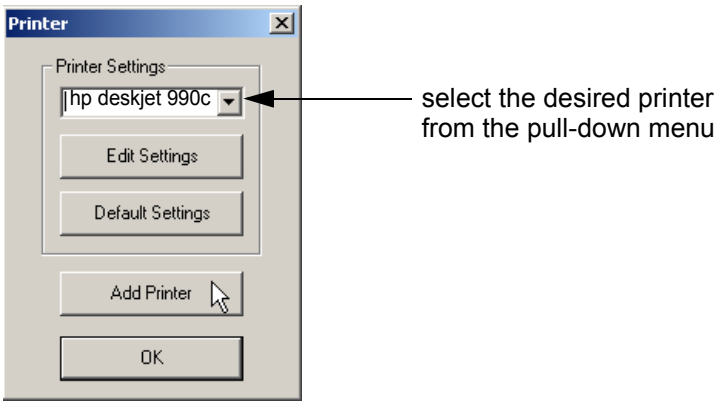


Figure 3-29 select the desired printer

NOTICE At older Software versions, first the warning message appears. After confirming with the YES button, select the desired printer and press the **upper trackball key** to call up the **"Printer Properties"**.

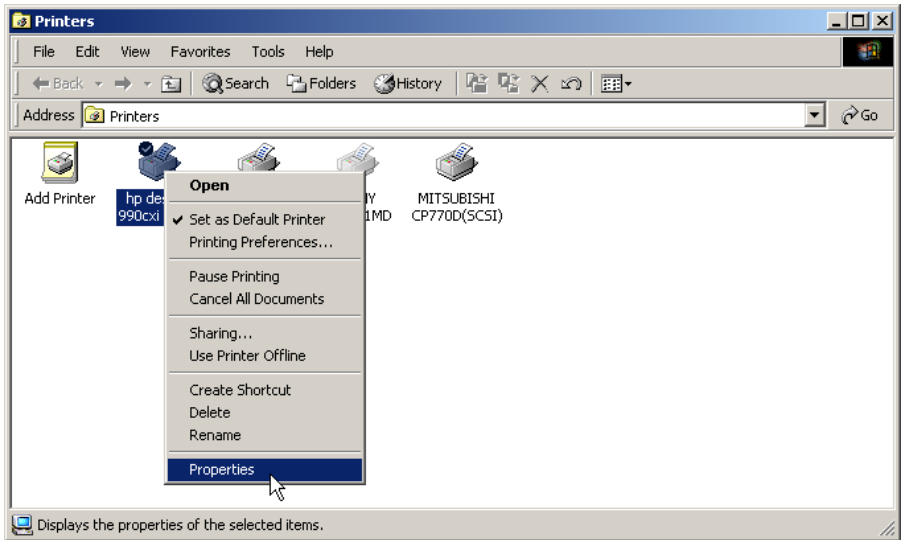


Figure 3-30 Printer Installation (at older Software versions)

To adjust the HP 990cxi / HP 995c Printer see: Section 3-5-5-1 "HP 990cxi / HP 995c - Printer Settings" .

To adjust the UP-D21MD Printer see: Section 3-5-5-2 "UP-D21MD - Printer Settings" .

To adjust the CP770DW Printer see: Section 3-5-5-3 "CP770DW - Printer Settings" .

WARNING ***After each printer installation, the leakage currents have to be measured acc. IEC 60601-1 resp. UL2601-1.***

3-5-5-1 HP 990cxi / HP 995c - Printer Settings

1.) Call up the **'Printer Properties'**; operation see: Section 3-5-5 "Adjustment of Printer Settings" .

2.) Select the **GENERAL** page and click the PRINTING PREFERENCES... button.

3.) Select the **SETUP** page for adjusting print quality and paper size.
Paper type should be set to 'Automatic'. See left Figure 3-31.

4.) Select the **FEATURES** page for adjusting 'Two-Side Printing' if desired.
'Orientation' must be set to 'Portrait'. See right Figure 3-31.

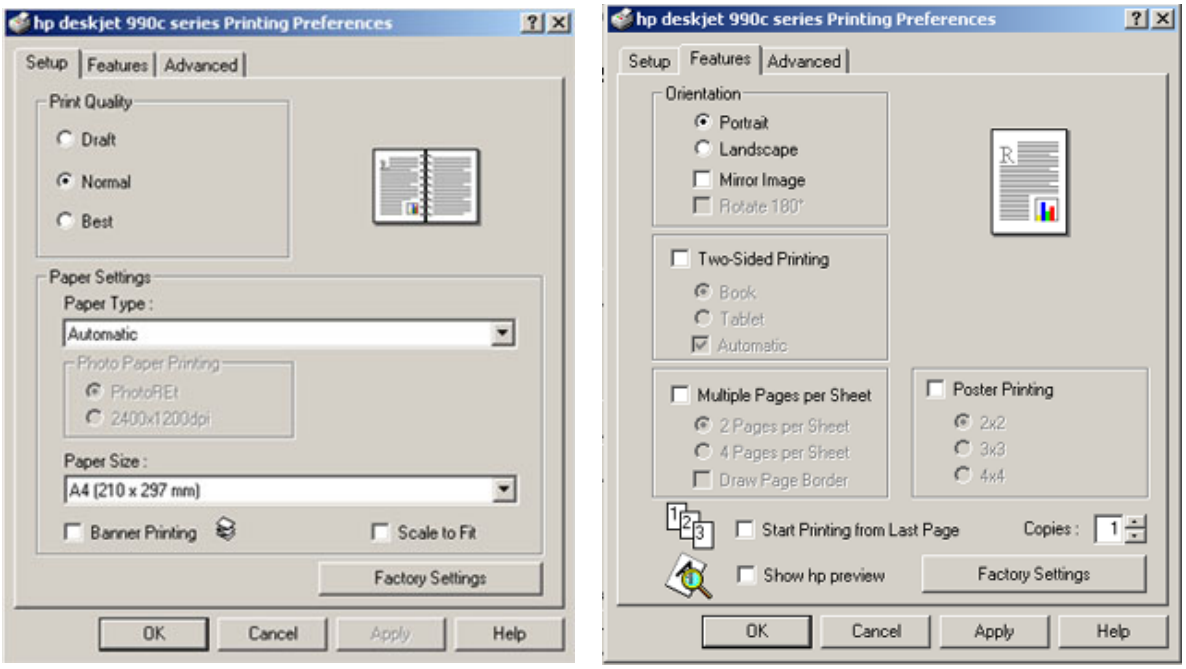


Figure 3-31 HP Printer - Settings

5.) For saving the adjusted printer settings click APPLY and then OK.

6.) Select the **PORTS** page and selct/verify the correct USB printer port.

7.) For saving the adjusted printer settings click APPLY and then OK.
Finally close the 'Printers'-window with the close button and exit System Setup with SAVE&EXIT.

8.) Assign the HP 990cxi / HP 995c printer as Report Printer;
see: Section 3-5-6 "Printer Remote Control Selection" on page 3-27.

9.) Print report page(s) containing measurements.
For operation see Basic User Manual of Voluson® 730.

10.)**Turn off** the system!

3-5-5-2 UP-D21MD - Printer Settings

1.) Call up the **'Printer Properties'**; operation see: Section 3-5-5 "Adjustment of Printer Settings" .

2.) Select the **PAPER** page and select: Orientation = **Landscape**, Paper = **UPC-21L** + **High Speed**.

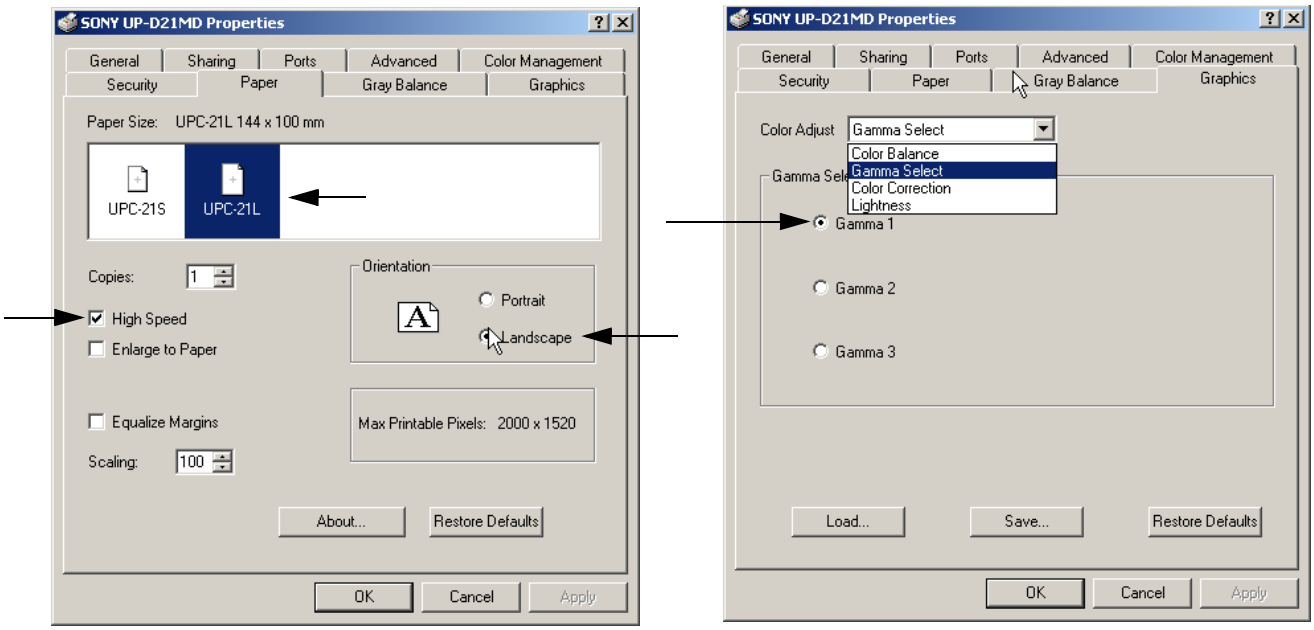


Figure 3-32 Paper page + Graphics page (Gamma Select)

3.) Select the **GRAPHICS** page, select "Gamma Select" from the pop-up menu: choose **Gamma 1**.

4.) Select "Color Correction" from the pop up menu: set **Printer Hardware Color Correction**.

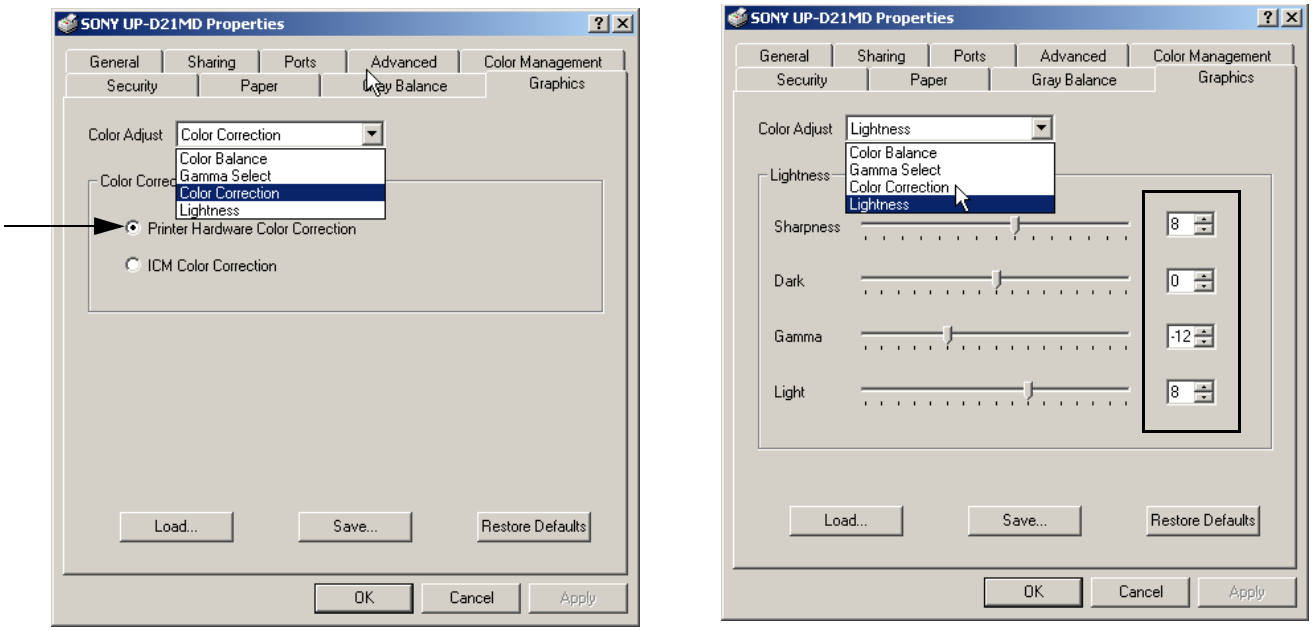


Figure 3-33 Graphics page (Color Correction + Lightness)

5.) Select "Lightness" from the pop-up menu: Sharpness = **7** or **8**; Dark = **0**; Gamma = **-12**; Light = **8**.

6.) For saving the adjusted printer settings click APPLY and then OK.
Finally close the 'Printers'-window with the close button and exit System Setup with SAVE&EXIT.

3-5-5-3 CP770DW - Printer Settings

1.) Call up the **'Printer Properties'**; operation see: Section 3-5-5 "Adjustment of Printer Settings" .

2.) Select the **PORTS** page and select/verify the correct printer port.

3.) Select the **GENERAL** page and click the PRINTING PREFERENCES... button.

4.) In the displayed **PAPER** page select: Paper Size = **S** and Orientation = **Portrait**.

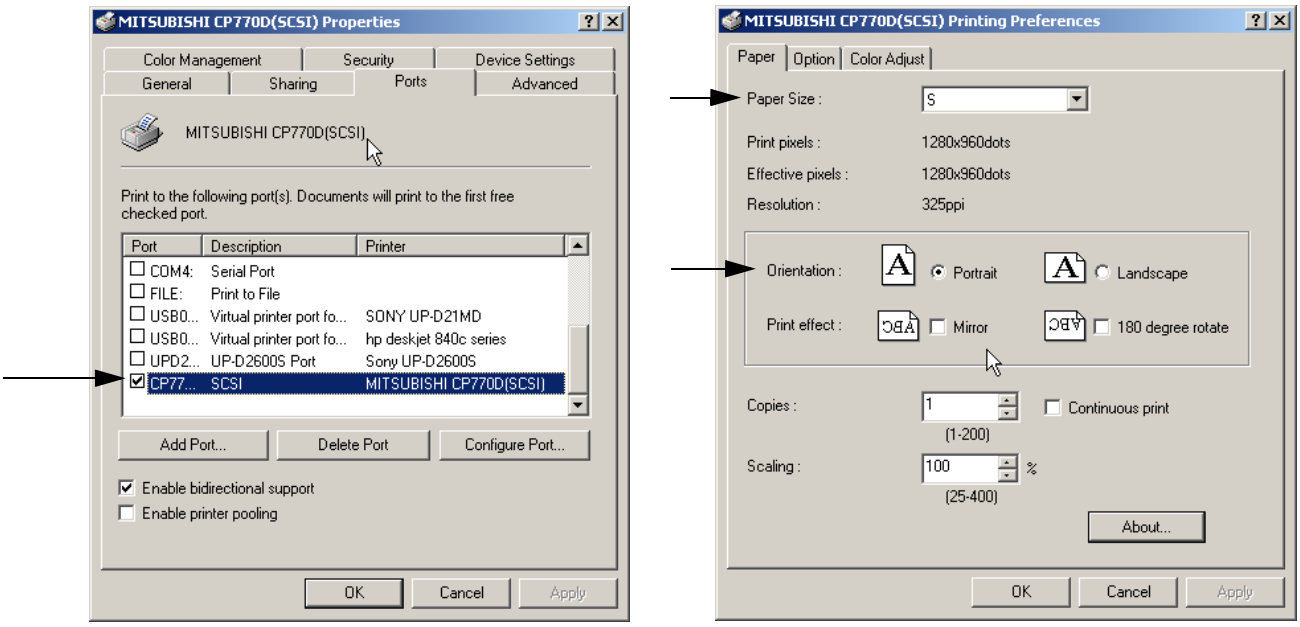


Figure 3-34 Ports page + Paper page

5.) Select the **COLOR ADJUST** page and click the GAMMA ADJ... button.

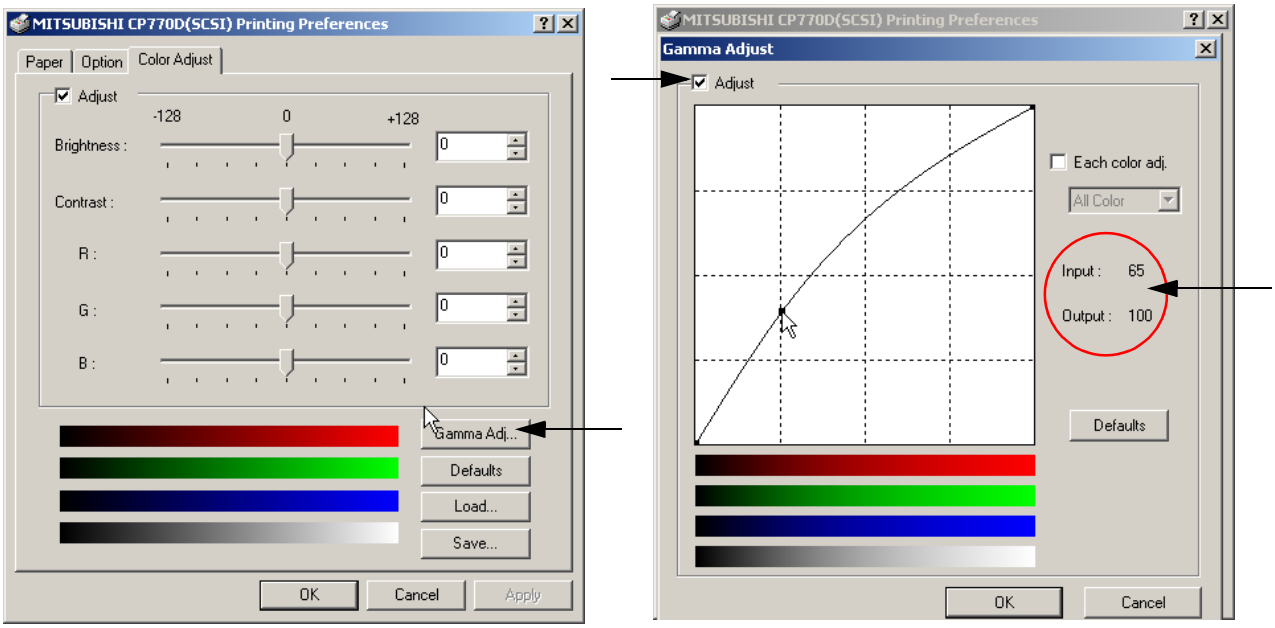


Figure 3-35 Color Adjust page + Gamma Adjust page

6.) Hook the "Adjust" field and move the line with the trackball till it shows: Input = **65**; Output = **100**.

3-5-5-3 CP770DW - Printer Settings (cont'd)

7.) For saving the adjusted printer settings click OK.

NOTE: When you call up the "Gamma Adjust" page again, the Input and Output parameters won´t be shown until re-adjustment of the displayed Gamma curve.

8.) For saving the adjusted printer settings click APPLY and then OK.

9.) Finally close the 'Printers'-window with the close button and exit System Setup with SAVE&EXIT.

3-5-6 Printer Remote Control Selection

To assign the Remote **PRINT A** key, Remote **PRINT B** key and Report Printer to desired Printer:

1.) On the Touch Panel, touch UTILITIES.

2.) In the Utilities menu, touch SYSTEM SETUP to invoke the setup desktop on the screen.

3.) Select the PERIPHERALS page.

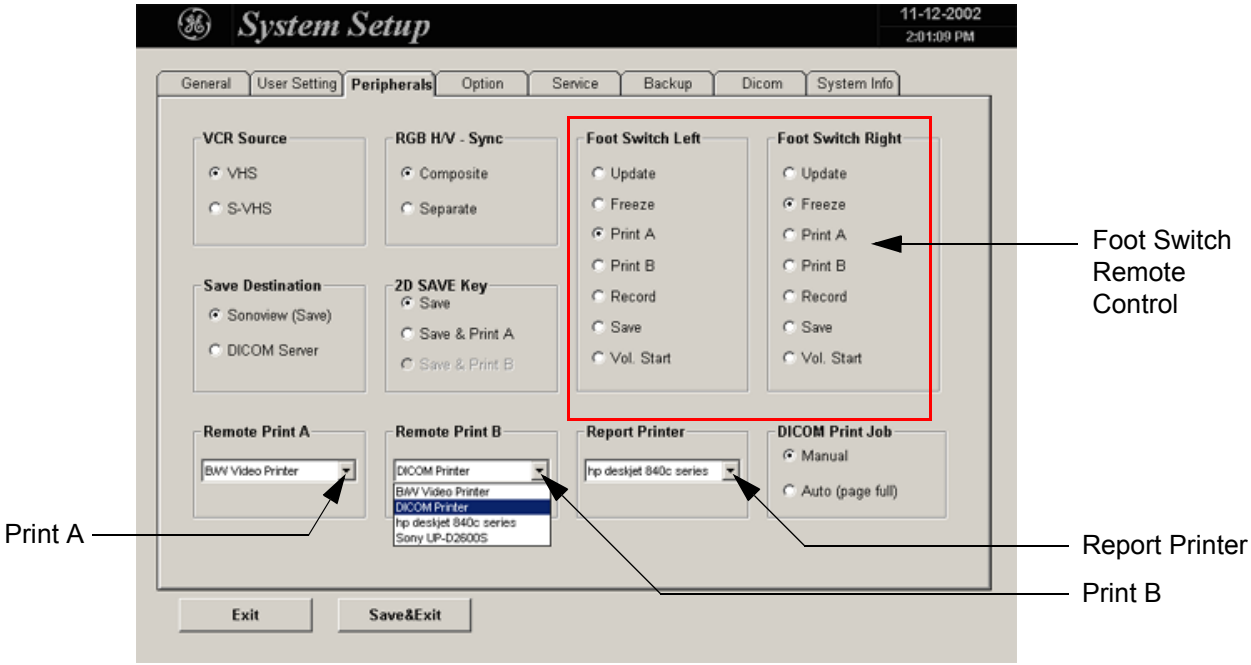


Figure 3-36 Peripherals page

- **Remote Print A:** Select the desired Printer for the remote control **PRINT A** key.
- **Remote Print B:** Select the desired Printer for the remote control **PRINT B** key.

NOTE: Optionally the Remote Control can be done by Foot switches.
Therefore select "Print A" or "Print B" in "Foot Switch Left" or "Foot Switch Right" - section.

- **Report Printer:** Select the desired Report Printer from the drop-down menu.

⚠ **NOTICE** The selected Report Printer (usually HP 990cxi or HP 995c) is used for printing reports and images from Sonoview.

Section 3-6
System Configuration

3-6-1 System Configuration

NOTE: To customize the system, see Chapter 17 - System Setup, Chapter 18 - Measurement Setup and Chapter 19 - Biopsy Setup of the Basic User Manual of Voluson® 730.

Modifications of system parameters are supported by diverse dialog pages and windows on the system setup desktop:

- **General** - Date, Time, Clinic Name, Language, Screen saver, etc.
- **User Settings** - to save User programs, 3D/4D programs, Auto Text, Doppler 2D Refresh, etc.
- **Peripherals** - to adjust the assignment of **PRINT** keys, select Save Destination, Video norm, etc.
- **Option** - shows which options are installed in the system
- **Service** - enter the password to get access to the Service Tools functions
- **Backup** - Backup Save, Backup Load
- **DICOM** - to set up all DICOM target nodes (image servers)
- **System Info** - shows which Software/Hardware version is installed in the system

To invoke the System Setup procedure:

1.) Touch the UTILITIES key on the Touch Panel.
2.) Touch the SYSTEM SETUP key in the “Utilities” menu to activate the setup desktop screen.

In general operations are done with the trackball and the trackball keys (mouse emulation).

Trackball (mouse position):
positions the pointing device (arrow) on the desktop

left Trackball key (left mouse button):
sets, fixates markers and activates pages/buttons etc. marked by the pointing device

upper Trackball key (right mouse button):
no function in system desktop

right Trackball key (left mouse button):
sets, fixates markers and activates pages/buttons etc. marked by the pointing device

3-6-1-1 How to enter Date and Time

Select the GENERAL page in the System Setup see: Figure 3-37.

1.) Select the “Date Format” (only one can be active).
2.) Click the DATE/TIME button to activate a sub dialog window to enter date, time and time zone.
3.) Click the TIME FORMAT button to activate a sub dialog window to choose the preferred time format.
4.) Click SAVE&EXIT to save Settings and exit System Setup.

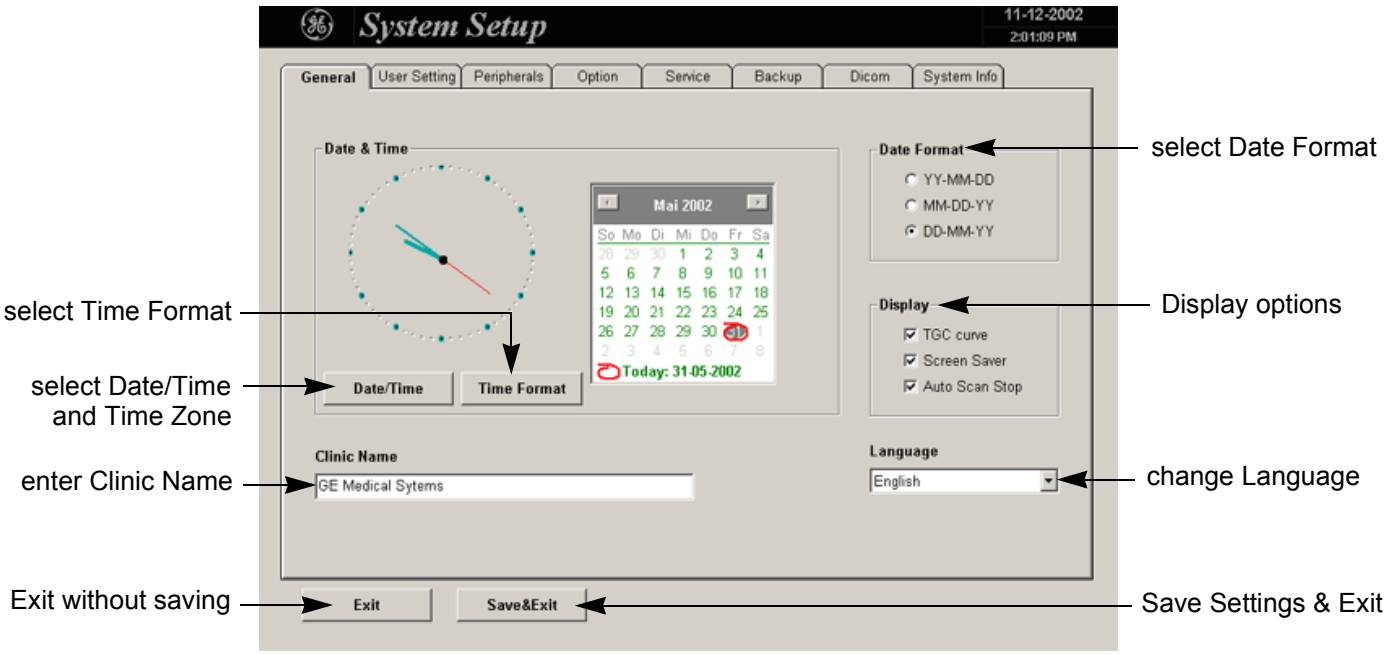


Figure 3-37 System Setup - General page

3-6-1-2 How to enter Hospital Name

Select the GENERAL page in the System Setup see: Figure 3-37.

1.) Select the text box to enter a new “Clinic Name” with the keyboard.
2.) Click SAVE&EXIT to save Settings and exit System Setup.

The clinic name will be copied into the Hospital ID in the information header.

3-6-1-3 How to change Language

Select the GENERAL page in the System Setup see: Figure 3-37.

1.) Select the desired language from the pop-up menu.
2.) Click SAVE&EXIT to save Settings and exit System Setup.

NOTE: After changing the language the system has to reboot.

3-6-2 On-Board Optional Peripherals

Table 3-8 Electrical Specifications for Voluson® 730

Voltage	Tolerances	Current	Frequency
100 VAC	±10%	10.10 A	50, 60 Hz (±2%)
115 VAC	±10%	8.80 A	50, 60 Hz (±2%)
130 VAC	±10%	7.80 A	50, 60 Hz (±2%)
230 VAC	±10%	4.40 A	50, 60 Hz (±2%)
240 VAC	±10%	4.20 A	50, 60 Hz (±2%)

Table 3-9 Approved Peripherals

Device	Manufacturer	Model	Video Signal
B/W Video Printer	SONY	UP-895MD	NTSC/PAL
B/W Video Printer	Mitsubishi	P91E	NTSC/PAL
Color Video Printer	SONY	UP-D2600S	SCSI-Port
Color Video Printer	SONY	UP-D21MD	USB-Port
Color Video Printer	Mitsubishi	CP770DW	SCSI-Port
Video Cassette Recorder	SONY	SVO-9500MD SVO-9500-MDP	NTSC PAL
Line Printer	Hewlett Packard	hp deskjet 990cxi	USB-Port
Line Printer	Hewlett Packard	hp deskjet 995c	USB-Port
ECG Preamplifier		MAN3	
ECG Preamplifier		MAN6	
Footswitch		MFT7	

3-6-3 External I/O Connection Panel (GES)

NOTICE If peripherals (e.g. VCR) are connected at the Internal I/O, some connectors on the External I/O may not be available. Please refer to Section 5-6 "Internal I/O" on page 5-28.

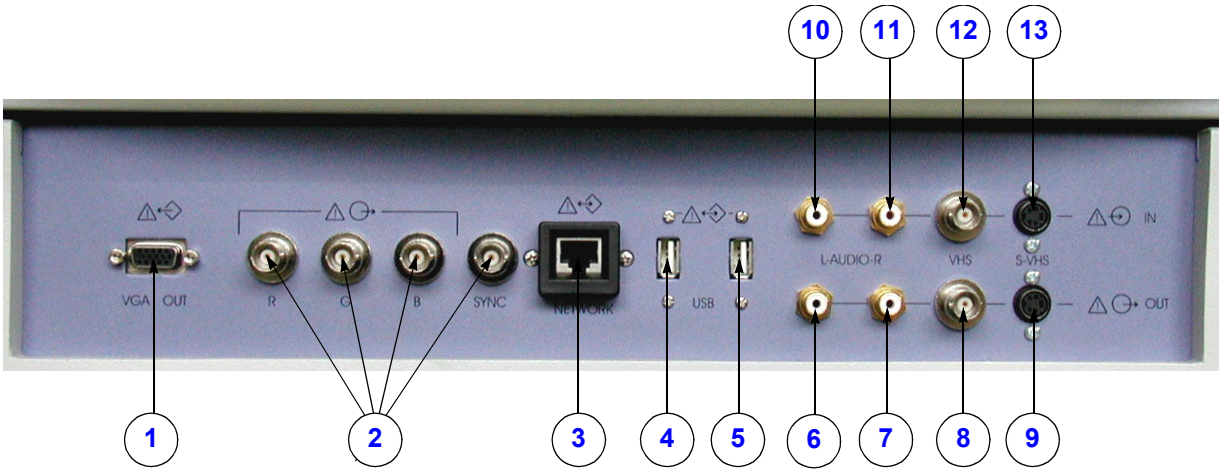


Figure 3-38 External I/O Panel Connectors

Table 3-10 External I/O Connector Description

Item	Connector Name	Table Number	Description		
1	VGA (OUTPUT)	Table 3-13	print out VGA signal with monitor/printer		
2	R, G, B, H/V, SYNC	Table 3-16	outputs for color video printer/monitor		
3	NETWORK	Table 3-15	DICOM input/output twisted pair RJ-45 10/100 megabit/s		
4	USB-1	Table 3-14	USB port		
5	USB-2	Table 3-14	USB port		
6	AUDIO LEFT OUT				
7	AUDIO RIGHT OUT				
8	VHS OUT				
9	S-VHS OUT	Table 3-12			
10	AUDIO LEFT IN				
11	AUDIO RIGHT IN				
12	VHS IN				
13	S-VHS IN	Table 3-11			

3-6-3-1 External I/O Pin Outs

Table 3-11 S-VHS IN Video Connector, 4 Pin

Pin No	Output Signal	Description
1	SVIDEO IN YG	Y (Luma) GND
2	SVIDEO IN CG	C (Chroma) GND
3	SVIDEO IN Y	Y (Luma) SIGNAL
4	SVIDEO IN C	C (Chroma) SIGNAL

Table 3-12 S-VHS OUT Video Connector, 4 Pin

Pin No	Output Signal	Description
1	SVIDEO OUT YG	Y (Luma) GND
2	SVIDEO OUT CG	C (Chroma) GND
3	SVIDEO OUT Y	Y (Luma) SIGNAL
4	SVIDEO OUT C	C (Chroma) SIGNAL

Table 3-13 VGA (Output) Connector, Sub-D 15 Pin

Pin No	Output Signal	Description
1	VGA OUT1 R	Red
2	VGA OUT1 G	Green
3	VGA OUT1 B	Blue
4, 9,11,12,15	N/C	N/C
5, 6, 7, 8, 10	GND	GND
13	VGA OUT1 HS	H Sync
14	VGA OUT1 VS	V Sync

Table 3-14 USB 1, 2 Connectors

Pin No	Output Signal	Description
1	VCC	USB Power Supply
2	- Data	USB Data (-)
3	+ Data	USB Data (+)
4	GND	USB Power Ground

Table 3-15 Network Connector, RJ45 Modular 8 Pin

Pin No	Output Signal	Description
1	ETHER TD	Ethernet RD+
2	ETHER TD	Ethernet RD-
3	ETHER RD	Ethernet TD+
6	ETHER RD	Ethernet TD-
Others	NC	Non-connection

Table 3-16 R, G, B, SYNC, L-Audio-R (IN/OUT), VHS (IN/OUT) Connectors

Pin No	Signal	Description
1 (Center Pin)	Signal	
2 (Koax Pin)	Signal GND	

Table 3-17 Footswitch Connector (located at Power Supply Module CPN - rear side)

Pin No	Input Signal	Description
1	Signal GND	
2	right switch	normally open
3	left switch	normally open
4	not connected	not connected

3-6-4 Video Specification

Video specifications may be needed to be able to connect laser cameras or other devices to the Voluson® 730.

Table 3-18 Video Specifications VGA Connector

S-Video Output set to: Timing Parameter	PAL 50Hz	NTSC 60Hz
Visible Resolution	800 x 600	800 x 600
Horizontal Rate [kHz]	47.20	57.10
H Total cycle time [µs]	21.20	17.50
H Sync width [µs]	1.50	1.48
H Back Porch [µs]	2.94	1.84
H Active Video Time [µs]	16.15	13.70
H Front Porch [µs]	0.616	0.512
Horizontal +/-	pos	pos
Vertical Rate [Hz]	75.00	90.00
Vertical Total cycle time [ms]	13.30	11.10
V Sync Width [ms]	0.170	0.140
V Back Porch [ms]	0.276	0.332
V Active Video Time [ms]	12.68	10.48
V Front Porch [ms]	0.174	0.144
Dot Clock [MHz]	49.54	58.39

Electrical Specifications on VGA Connector

- Signal Level: 700 mV at 75 Ohm
- H/V Sync: TTL Level

Table 3-19 Video Specifications for Composite, B/W, S-Video and RGB Connectors

S-Video Output set to: Timing Parameter	PAL 50Hz	NTSC 60Hz
Visible Resolution	800 x 600	800 x 600
Pixel Clock	17.734475 MHz = 4* ft.	14.318 MHz = 4* ft.
Horizontal Total Line	64µs / 1135 Pixel	63.56µs / 910 Pixel
Horizontal Active Display	50.50µs / 902 Pixel	52.50µs / 752 Pixel
Horizontal Front Porch	1.96µs / 35 Pixel	1.62µs / 23 Pixel
Horizontal Sync Width	4.62µs / 82 Pixel	4.68µs / 67 Pixel
Horizontal Back Porch	6.52µs / 116 Pixel	4.76µs / 68 Pixel
Vertical Total Lines	20ms / 312.50 Lines	16.68ms / 262.50 Lines
Vertical Active Lines	18.18ms / 284 Lines	15.22ms / 239.50 Lines

Table 3-19 Video Specifications for Composite, B/W, S-Video and RGB Connectors

S-Video Output set to: Timing Parameter	PAL 50Hz	NTSC 60Hz
Vertical Front Porch	256us 4 Lines	381us / 6 Lines
Vertical Sync	160us / 2.50 Lines	190us 7 3 Lines
Vertical Back Porch	1408us / 22 Lines	890us / 14 Lines
Serration Pulses	5	6
Interlaced	yes	yes
Aspect Ratio pixel size	14.75 (H) : 17.734475 (V)	14.75 (H) : 14.318 (V)
Video levels on 75 Ohm:		
white level	1020mV	1020mV
black level	370mV	370mV
blanking level	320mV	320mV
sync level*	20mV	20mV

* RGB OUT has no sync on signals - other values decrease by 300mV

3-6-5 Available Probes

See *Chapter 9 - Probes*, for part numbers to be used when ordering new or replacement service probes.

3-6-6 Software/Option Configuration

Refer to the Voluson® 730 Basic User Manual, Chapter 17.3.1, System Setup - General, for information on configuring items like Clinic Name, Language, Display, Date/Time, Date Format and Time Format.

For information on configuring User Settings, refer to Refer to the Voluson® 730 Basic User Manual, Chapter 17.3.2, System Setup - User Settings.

For information on configuring assignment of **PRINT** keys, Save Destination, Video norm, etc., refer to the Voluson® 730 Basic User Manual, Chapter 17.3.3, System Setup - Peripherals.

For information on configuring Software Options, refer to the Voluson® 730 Basic User Manual, Chapter 17.3.4, System Setup - Options.

For information on configuring DICOM Connectivity, refer to the Voluson® 730 Basic User Manual, Chapter 17.3.8, System Setup - DICOM.

For information on configuring General Measurement Setup, refer to the Voluson® 730 Basic User Manual, Chapter 18.3.1.

For information on configuring Obstetric Measurement Setup, refer to the Voluson® 730 Basic User Manual, Chapter 18.3.2.

For information on configuring Cardiac Measurement Setup, refer to the Voluson® 730 Basic User Manual, Chapter 18.3.3.

Section 3-7
Connectivity Installation Worksheet

Site System Information

Site:

Dept:

Serial #: Type:

Floor:

Room:

REV:

Comments:

CONTACT INFORMATION

Name	Title	Phone	E-Mail Address

TCP/IP Settings

Name - AE Title:

IP Settings

IP Address:

Subnet Mask:

Default Gateway:

Remote Archive Setup

Remote Archive IP:

Remote Archive Name:

Services (Destination Devices)

	Device Type	Manufacturer	Name	IP Address	Port	AE Title
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Section 3-8
Network IP Address Configuration

NOTE: Following Information must be provided by customer or hospital engineer before you can start:
A Station name, AE Title, IP address and Port Number for the Voluson® 730.
The IP addresses for the default gateway and other routers at the site for ROUTING INFORMATION. Only if necessary (e.g. for Internet access).

1.) Touch the UTILITIES key on the Touch Panel once to display the Utilities menu.
2.) Select SYSTEM SETUP and open the DICOM page on the System Setup desktop screen.
3.) Click the NETWORK CONFIG button, read the message and afterwards confirm with YES.

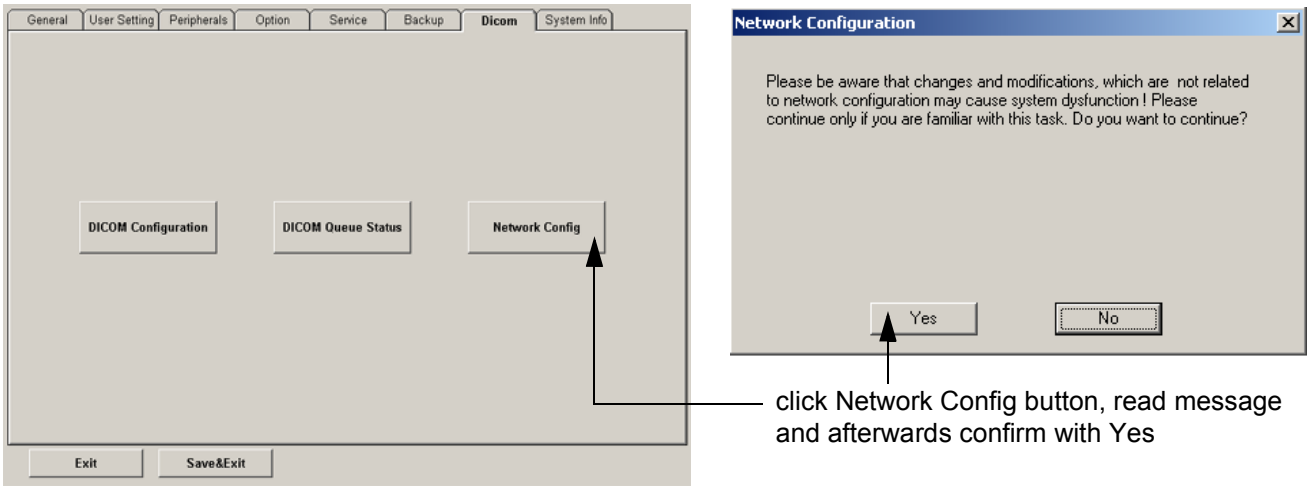


Figure 3-39 Network Configuration

4.) The “Internet Protocol (TCP/IP) Properties” dialog page appears.

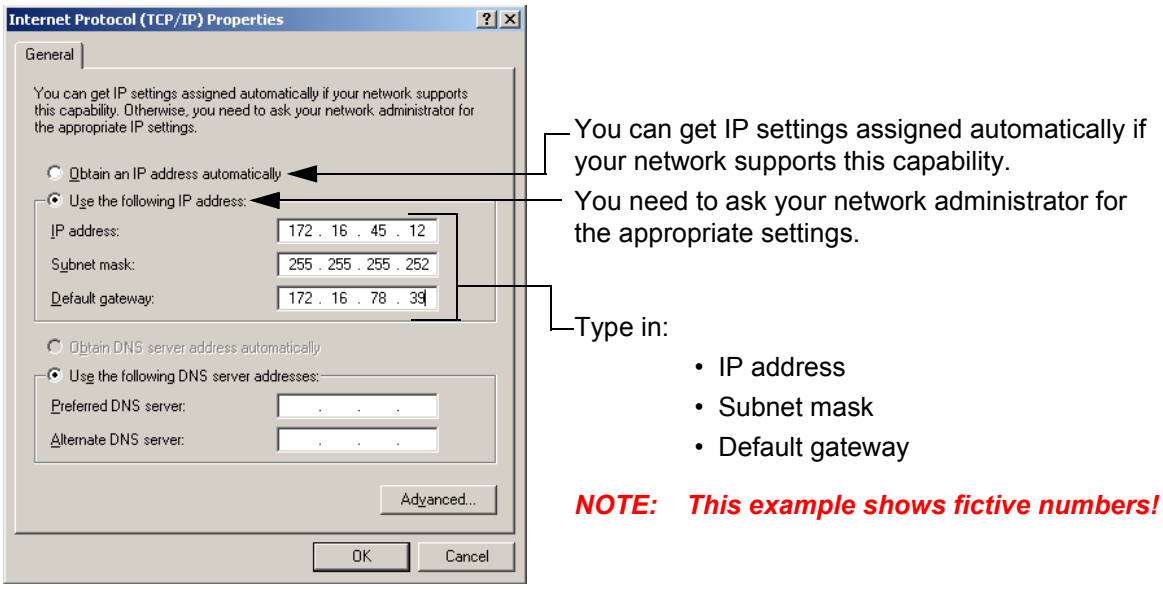

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 172 . 16 . 45 . 12
Subnet mask: 255 . 255 . 255 . 252
Default gateway: 172 . 16 . 78 . 39
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel
You can get IP settings assigned automatically if your network supports this capability.
You need to ask your network administrator for the appropriate settings.
Type in:
• IP address
• Subnet mask
• Default gateway
NOTE: This example shows fictive numbers!

Figure 3-40 Internet Protocol (TCP/IP)

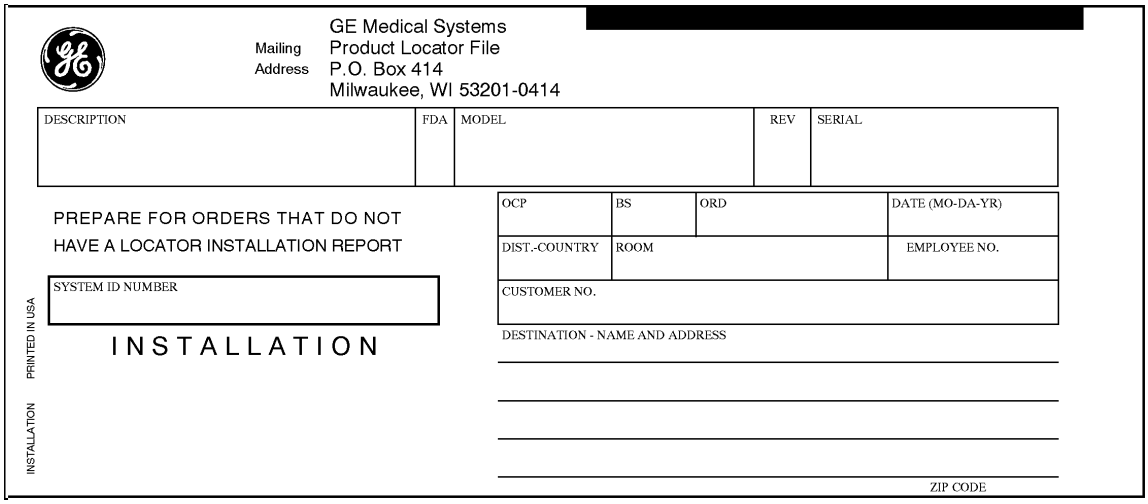
To specify a DICOM Address, follow the instructions of described in the Basic User Manual, Chapter 17.3.8 of the Voluson® 730.

Section 3-9
Paperwork

NOTE: During and after installation, the documentation (i.e. User´s Manual, Installation Manual,...) for the peripheral units must be kept as part of the original system documentation. This will ensure that all relevant safety and user information is available during the operation and service of the complete system.

3-9-1 Product Locator Installation

NOTE: The Product Locator Installation Card shown may not be same as the provided Product Locator card.


GE Medical Systems
Mailing Address
Product Locator File
P.O. Box 414
Milwaukee, WI 53201-0414

DESCRIPTION	FDA	MODEL	REV	SERIAL

PREPARE FOR ORDERS THAT DO NOT HAVE A LOCATOR INSTALLATION REPORT

SYSTEM ID NUMBER

INSTALLATION

OCP	BS	ORD	DATE (MO-DA-YR)
DIST.-COUNTRY	ROOM		EMPLOYEE NO.
CUSTOMER NO.			

DESTINATION - NAME AND ADDRESS

ZIP CODE

PRINTED IN USA

INSTALLATION

Figure 3-1 Product Locator Installation Card

3-9-2 User Manual(s)

Check that the correct User Manual(s) for the system and software revision, is included with the installation. Specific language versions of the User Manual may also be available. Check with your GE Sales Representative for availability.

Chapter 4
Functional Checks

Section 4-1
Overview

4-1-1 Purpose of Chapter 4

This chapter provides procedures for quickly checking major functions of the Voluson® 730 scanner diagnostics by using the built-in service software, and power supply adjustments.

Table 4-1 Contents in Chapter 4

Section	Description	Page Number
4-1	Overview	4-1
4-2	Required Equipment	4-1
4-3	General Procedure	4-2
4-4	Functional Checks	4-7
4-5	Software Configuration Checks	4-31
4-6	Peripheral Checks	4-32
4-7	Mechanical Function Checks	4-33
4-8	Site Log	4-36

NOTICE Most of the information pertaining to this Functional Checks chapter is found in the Voluson® 730 Basic User Manual (Direction number 105837).

Section 4-2
Required Equipment

- An empty (blank) MO Disk or CD-RW.
- At least one transducer. See *"Probes" on page 9-29* for an overview.
  (normally you should check all the transducers used on the system)

Section 4-3
General Procedure

CAUTION **SYSTEM REQUIRES ALL COVERS**
Operate this unit only when all board covers and frame panels are securely in place. The covers are required for safe operation, good system performance and cooling purposes.

NOTICE Lockout/Tagout Requirements (For USA only)

Follow OSHA Lockout/Tagout requirements by ensuring you are in total control of the Power Cable on the system.

4-3-1 Power On / Boot Up

NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

4-3-1-1 Scanner Power On

1.) Connect the Power Cable to the back of the system.
2.) Connect the Power Cable to an appropriate mains power outlet.
3.) Switch ON the Circuit Breaker at the rear of the system.

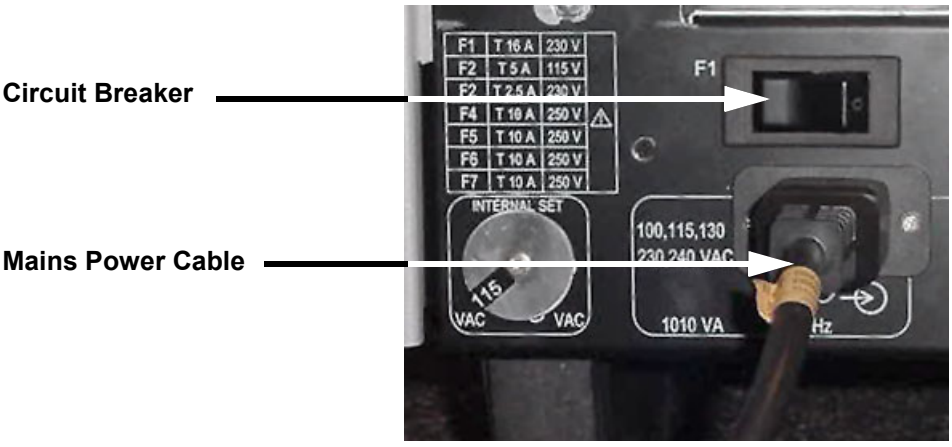


Figure 4-1 Circuit Breaker and Power Cable on Back of Voluson® 730

NOTICE When AC power is applied to the scanner, the **ON/OFF** switch on the Control panel illuminates amber, indicating the System (including the Back-end Processor) is in standby mode.

4.) Press the **ON/OFF** Standby switch left below the Control Panel once.

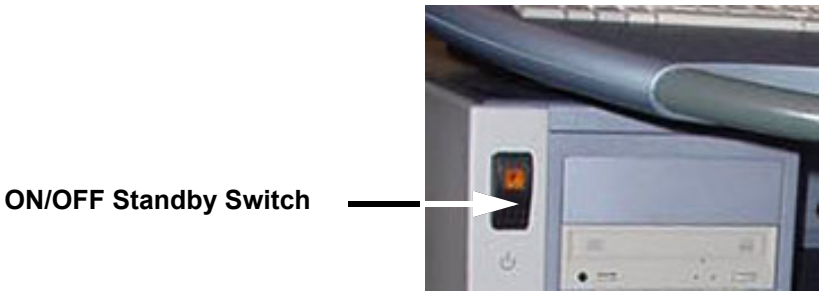


Figure 4-2 ON/OFF Stand-By Switch

When the **ON/OFF** Standby switch left below the Control Panel is pressed once, the System (including the Back-end Processor) starts and the software code is distributed to initiate the scanner.

The company logo appears on the Touch Panel during boot up.
Depending on the BIOS-Version no status messages are displayed during this process.
Boot up time is about 3 minutes.

NOTE: The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the Standby switch. So the auxiliary equipment need not to be switched ON/OFF separately.

4-3-2 Power Off / Shutdown

NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

4-3-2-1 Scanner Shutdown

1.) Press the **ON/OFF** Standby switch left below the Control Panel once.
2.) Switch OFF the Circuit Breaker at the rear of the system.
3.) Disconnect the Mains Power Cable is necessary. *For example:* Relocating the scanner.

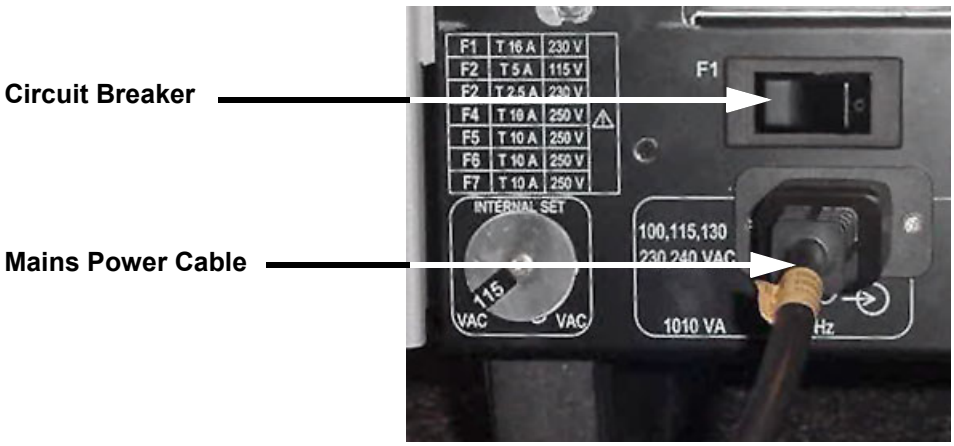


Figure 4-3 Circuit Breaker and Power Cable on Back of Voluson® 730

4-3-3 System Features

4-3-3-1 Control Panel

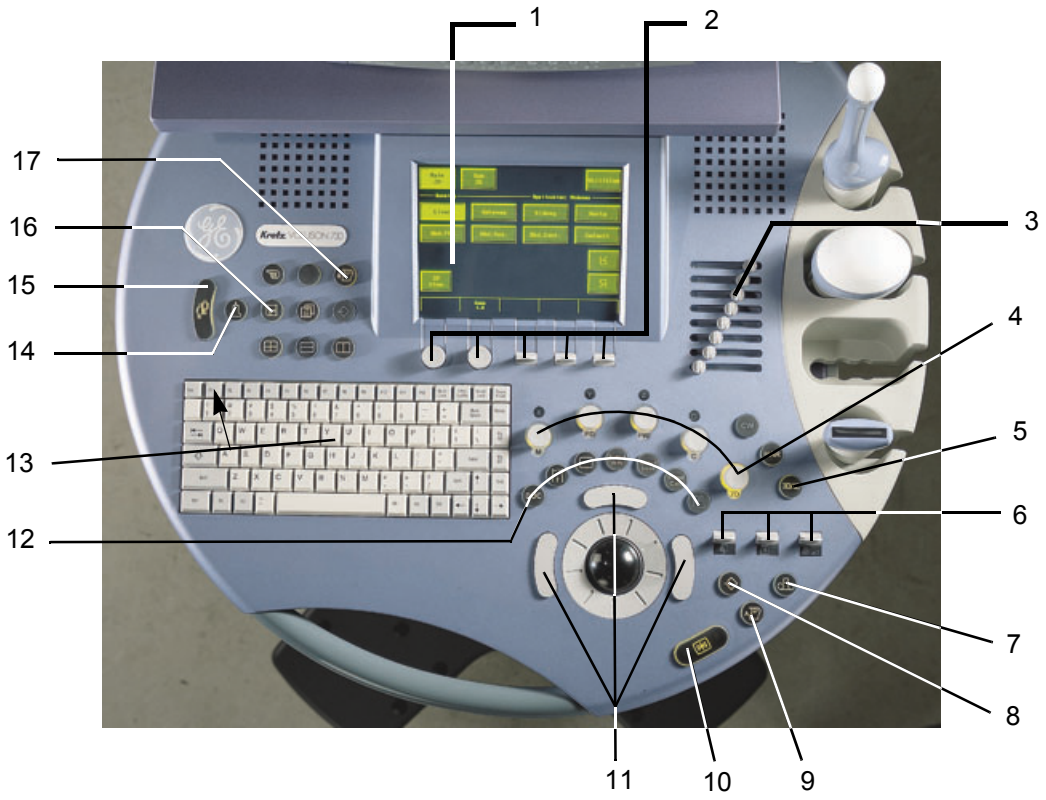


Figure 4-4 Control Panel Tour

1.) Touch Panel screen
2.) Touch Panel digipot and toggle switch controls
3.) TGC - Slider Controls
4.) Mode/Gain keys
5.) 3D/4D Volume Mode key
6.) Depth-, Focus- and Power toggle switch controls
7.) VCR Remote Control key
8.) Print A Trigger key
9.) Inter memory key to save to Sonoview or send to DICOM server
10.) Freeze / Run key
11.) Trackball and Trackball keys
12.) Annotation and Measurement keys
13.) Keyboard and F1 key to invoke the electronic user manual (EUM)
14.) Probe key
15.) Patient Data Entry key
16.) Network key (Sonoview)
17.) Printer B Trigger key

4-3-3-2 Touch Panel

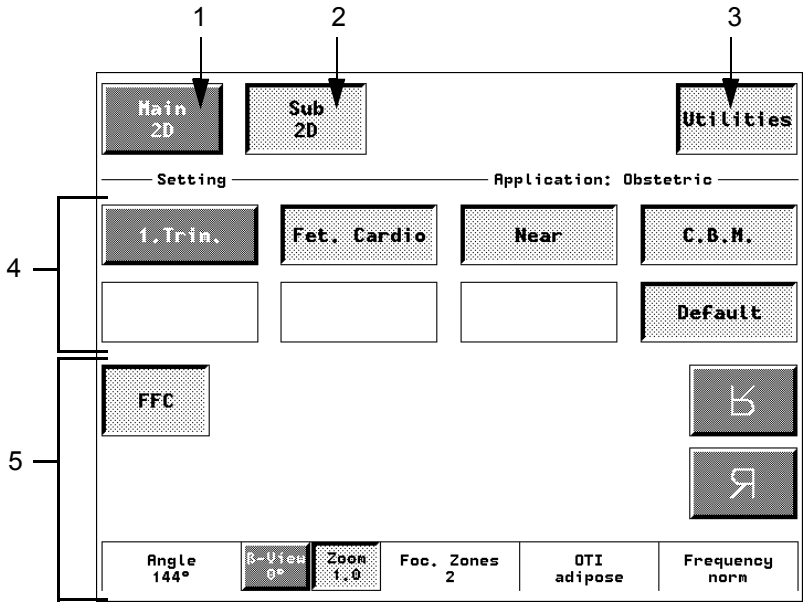


Figure 4-5 Touch Panel - Main Menu

1.) Main menu key: to change from one Sub menu to another.
2.) Sub menu key: to adjust settings of the selected Scan mode.
3.) Utilities key: activates the configuration system. The UTILITIES key is available in each Main menu.
4.) Setting window: shows all settings for the active application. The active one is highlighted.
5.) Additional functions which are supported by the selected Mode.

NOTE: Different menus are displayed depending on which Touch Panel Menu is selected.

At the bottom of the Touch Panel, there are combination rotary dials/push buttons and flip switch controls. The functionality of these controls changes, depending upon the currently displayed menu. Press the button to switch between controls (as with ß-View/Zoom), or rotate the dial to adjust the value.

4-3-3-3 Monitor Display

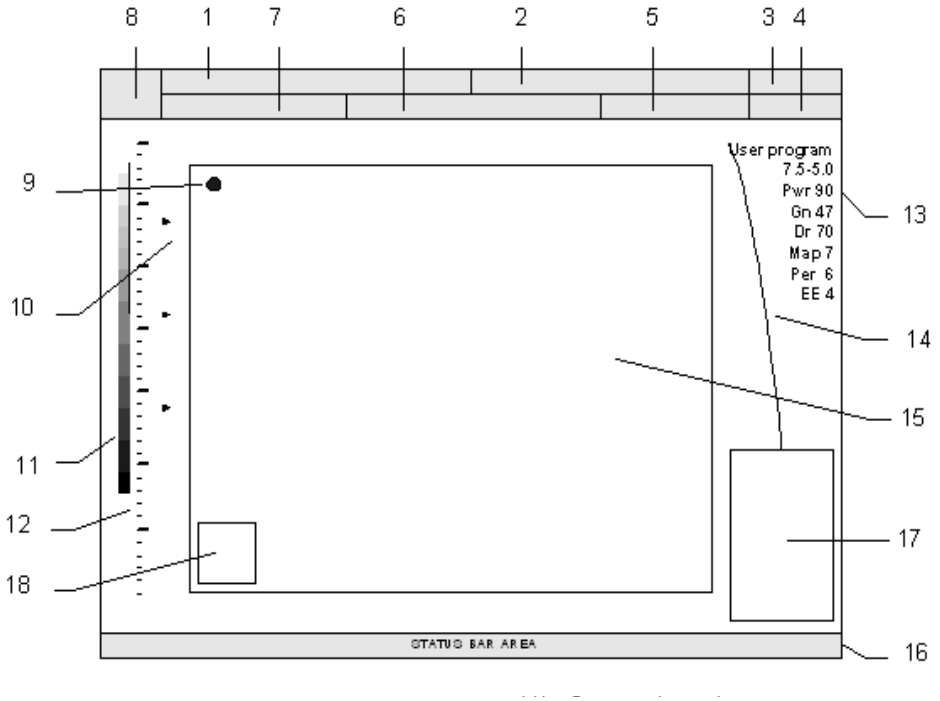


Figure 4-6 Monitor Display Tour

Table 4-2 Monitor Display Features

1. Patient Name (family, given, prefix)	10. Focal zone marker(s)
2. Hospital Identification	11. Gray scale wedge
3. Date	12. Depth scale markers
4. Time	13. Image Info
5. Depth / Frame rate	14. TGC curve
6. Probe / Application	15. Image Area
7. Patient Identification (ID-number)	16. Status Bar
8. Logo	17. Measurement results
9. Orientation marker	18. Bodymarks

Section 4-4
Functional Checks

For a basic functional check of the system's different modes, following pageswill familiarize you with image optimization for:

- 2D-Mode (B-Mode)
- M-Mode
- Spectral Doppler Modes
  - PW - Pulsed Wave Doppler
  - CW - Continuous Wave Doppler
- Color Doppler Modes
  - CFM - Color Flow Mode
  - PD - Power Doppler
  - TD - Tissue Doppler
- Volume Modes
  - 3D
  - Real Time 4D
  - Live 3D
  - Real Time 4D Biopsy
  - VCI - Volume Contrast Imaging

NOTE: Some software may be considered standard depending upon system configuration. If any Modes or Options are not part of the system configuration, the check can be omitted.

NOTE: Different menus are displayed depending on which Touch Panel Menu and which Mode is selected. Some function keys only appear on the Touch Panel if they are available for the selected Probe.

4-4-1 2D-Mode Checks

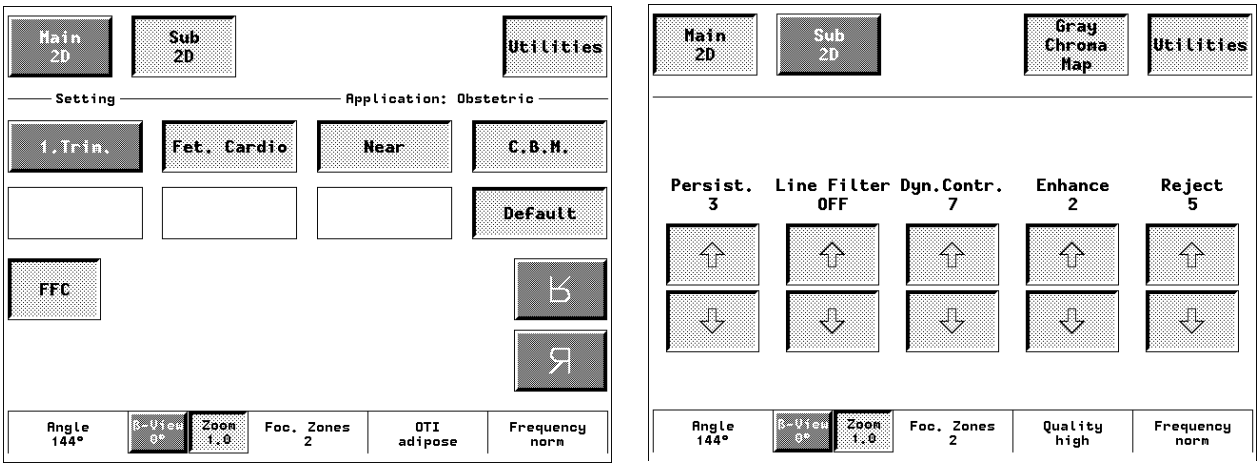


Figure 4-7 2D Main- and 2D Sub Menu

4-4-1 2D-Mode Checks (cont'd)

Table 4-3 2D-Mode Functions

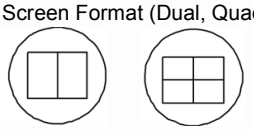
Step	Task	Expected Results
1	2D-Mode Gain	Rotate the **2D-MODE** key to adjust the sensitivity (brightness) of the entire image.
2	Transmit Power	Optimizes image quality and allows user to reduce beam intensity.
3	Focus Depth	To select the depth position of the actual focus zone(s). Arrows at the left edge of the 2D-Image mark the active focal zone(s) by their depth position.
4	Depth	Adjusts the depth range of the ultrasound image for the region of interest. The number of image lines and the frame rate are automatically optimized.
5	Screen Format (Dual, Quad) 	Press this keys to change the display Mode from Single to **DUAL** or **QUAD** display mode. Press the **2D-MODE** key to change from Dual or Quad to Single display.
6	FFC (Focus and Frequency Composite)	FFC combines a low frequency to increase the penetration and higher frequency to keep a high resolution. It reduces speckle and artifacts in the 2D-image.
7	CRI (Compound Resolution Imaging)	Pulses are transmitted not only perpendicularly to the acoustic window, but also in oblique directions. The advantages of CRI are enhanced contrast resolution with better tissue differentiation and clear organ borders.
8	LINEAR / TRAPEZ	Advantage of the Trapezoid-Mode: The scan area is very increased in relation to the linear display by steering the ultrasound lines in the border of the probe.
9	Image Orientation	Use the LEFT/RIGHT respectively the UP/DOWN keys on the Touch Panel to alternate the image orientation.
10	**ANGLE**	Use this control to select a part of interest of the 2D-Image. The advantage of the decreased field-of-view is an increased 2D frame rate due to the smaller sector width.
11	**ß-VIEW**	This function allows the adjustment of the Volume O-Axis position of 3D probes in 2D-Mode. The green line in the displayed symbol indicates the position of the acoustic block.
12	**ZOOM**	Image magnification (Pan Zoom) in Read-/ and Write-Mode.
13	**FOC. ZONES**	Increases the number of transmit focal zone, so that you can tighten up the beam for a specific area.
14	**OTI** (Otimized Tissue Imaging)	OTI™ allows to "fine tune" the system for scanning different kinds of tissue.
15	**FREQUENCY**	To adjust the range of the receive frequency. high resolution / lower penetration, mid resolution / mid penetration, or lower resolution / high penetration
16	GRAY CHROMA MAP	A gray map determines the displayed Brightness of an echo in relationship to its amplitude.

Table 4-3 2D-Mode Functions

Step	Task	Expected Results
17	PERSIST.	Persistence is a temporal filter that averages frames together. This has the effect of presenting a smoother, softer image.
18	LINE FILTER	The signals of the neighboring pulses are less weighted for the display of the actual pulse which considerably improves the detail lateral resolution and signal-to-noise ratio.
19	DYN.CONTR.	Dynamic Range controls how echo intensities are converted to shades of gray, thereby increasing the adjustable range of contrast.
20	ENHANCE	Edge Enhance brings out subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures. Adjustments to M Mode's edge enhancement affects the M Mode only.
21	REJECT	Selects a level below which echoes will not be amplified (an echo must have a certain minimum amplitude before it will be processed).
22	**QUALITY**	Control to improve the resolution by reducing the frame rate. Respectively reducing the resolution by increasing the image frame rate.

For further details refer to the Voluson® 730 Basic User Manual, Chapter 5, 2D-Mode.

4-4-2 M-Mode Checks

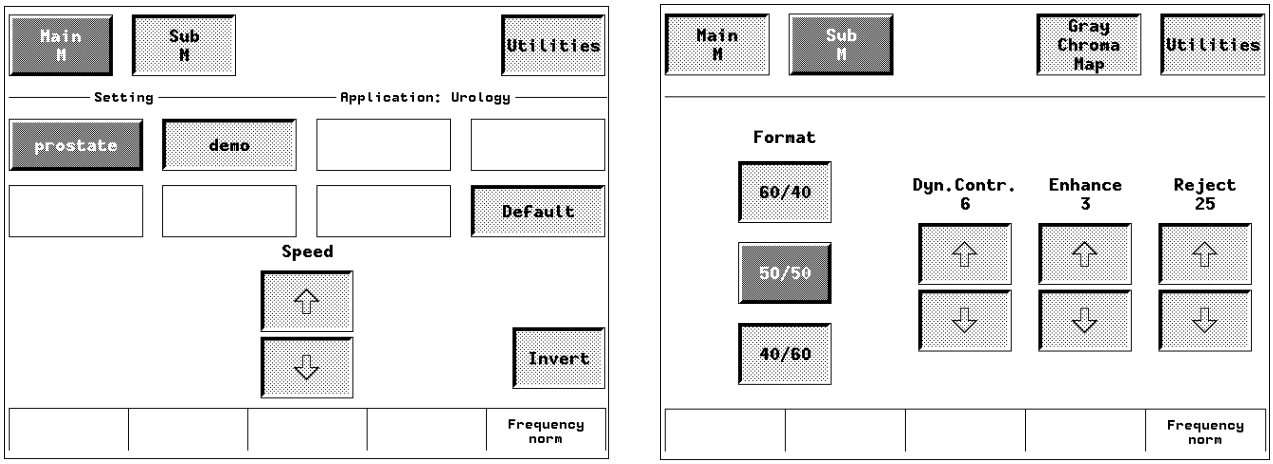


Figure 4-8 M Main- and M Sub Menu

Table 4-4 M-Mode Functions

Step	Task	Expected Results
1	Cursor Position	Adjust the M-Cursor position with the **TRACKBALL** in the B-Single image.
2	Activation of M-Mode	Press the **right or left trackball key** to activate both Modes (B/M).
3	M-Mode Gain	Rotate the **M-MODE** key to adjust the sensitivity (brightness) of the entire M-image.
4	M-Mode Depth	Common with B-Mode Depth.
5	SPEED	By touching up or down, four different sweep speeds can be selected.
6	INVERT	Invert of the M-Mode image.
7	**FREQUENCY**	Common with B-Mode Frequency.
8	FORMAT	For selection of three different rations of display format.
9	DYN.CONTR.	Dynamic Range enhances a part of the grayscale to make it easier to display pathology.
10	ENHANCE	Due to this function a finer, sharper impression of the image is produced.
11	REJECT	It determines the amplitude-level below which echoes are suppressed (rejected).

For further details refer to the Voluson® 730 Basic User Manual, Chapter 6, M-Mode.

4-4-3 Spectral Doppler Mode Checks

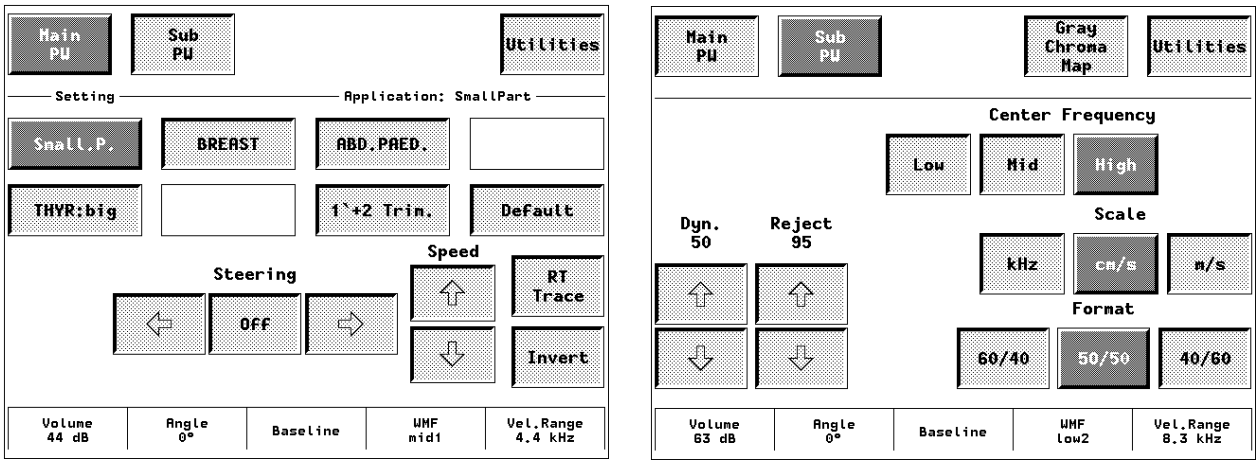


Figure 4-9 PW Main- and PW Sub Menu

Table 4-5 Spectral Doppler Mode (PW, CW) Functions

Step	Task	Expected Results
1	Gate Position and Gate Size	Adjust the Gate- Position resp. Size with the **TRACKBALL** in the B-Single image. The **upper trackball key** changes from Gate position to Gate size.
2	Activation of Doppler-Mode	Press the **right trackball key** to activate the motion display. Press the **left trackball key** to activate both Modes (B/D).
3	Doppler-Gain	Rotate the **PW-MODE** key to adjust the amplification of the entire spectrum.
4	STEERING	The steering function is only available with linear probes.
5	SPEED	By touching up or down, four different sweep speeds can be selected.
6	RT TRACE (Real time Auto-Trace)	The envelope curve of the Doppler spectrum (maximum velocities) and the corresponding evaluations are automatically displayed on the monitor.
7	INVERT	To invert the Doppler spectrum display in relation to the direction of the flow.
8	**ANGLE**	The angle cursor can be turned in both directions without stop. By pressing the angle knob repeatedly the angle correction switches from +60° to 0° and to -60°.
9	**BASELINE**	Adjusting the baseline is possible in Read- and Write-Mode (up/down in 8 steps).
10	**WMF** (Wall Motion Filter)	Used to eliminate Doppler “noise” that is caused by vessel wall motion.
11	**VEL. RANGE** respectively PRF	The Velocity Range display is governed by the pulse repetition frequency (PRF) Exceeding the maximum PRF, the HPRF-Mode is automatically switched on.
12	DYN.	Dynamic Range adjusts the display cutoff of the Doppler analysis waveform.
13	REJECT	Low echo information below the adjusted reject level will not be displayed.
14	CENTER FREQUENCY	It serves for selection of the required transmit frequency.
15	SCALE	To select the displayed measuring unit (in relation to the zero-line).
16	FORMAT	For selection of either one of three formats.

For further details refer to the Voluson® 730 Basic User Manual, Chapter 7, Spectral Doppler Mode.

4-4-4 Color Doppler Mode Checks

NOTE: Different menus are displayed depending on which Color Doppler Mode (CFM, PD or TD)is selected.

NOTE: The Tissue Doppler Mode is an Option. The TD key in the 2D Main menu is only visible if the option is installed and the selected probe is capable for the Tissue Mode.

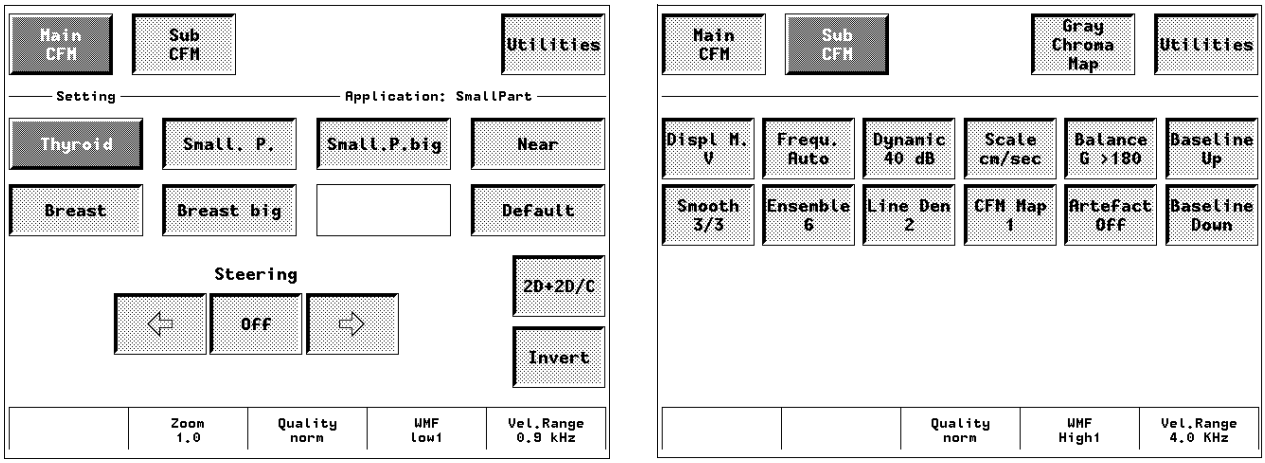


Figure 4-10 CFM Main- and CFM Sub Menu

Table 4-6 Color Doppler Mode (CFM, PD, TD) Functions

Step	Task	Expected Results
1	Color-Box Position and Color-Box Size	Adjust the Box- Position resp. Size with the **TRACKBALL** in the B-Single image. The **upper trackball key** changes from Box position to Box size.
2	CFM-Gain PD-Gain TD-Gain	Rotate the **C-MODE** key to ensure that continuous flow is displayed, where appropriate. Rotate the **PD-MODE** key to adjust the Power Doppler Gain. Rotate the **C-MODE** key to adjust the Tissue Doppler Gain.
3	STEERING	Beam Steering is only possible with linear probes in CFM- and PD-Mode.
4	2D+2D/C (PD or TD)	Changes the Single image display to two simultaneous half images. The left frame shows only the 2D-Mode image. The right frame shows the 2D-Mode image with color information.
5	INVERT	The color of the color wedge inverts around the baseline. (impossible in PD-Mode)
6	**ZOOM**	Image magnification (PAN-Zoom) in Read- and Write-Mode.
7	**QUALITY**	Improves the Color Resolution by reducing the image frame rate, respectively vice versa.
8	**WMF** (Wall Motion Filter)	Used to eliminate Doppler “noise” that is caused by vessel wall or cardiac wall motion. (CFM,PD)
9	**VEL. RANGE** respectiv. **PRF**	By touching toward up the PRF increases. By touching toward the PRF decreases.
10	**THRESHOLD**	After **FREEZE** you can adjust the Color Threshold. It eliminates small color noise or motion artifact signals in the color image. (small number cuts off less signals than a higher setting)
11	DISPL. M	To select the CFM- Display Mode (V; V-T; V-Pow; Pow-T; or T).

Table 4-6 Color Doppler Mode (CFM, PD, TD) Functions

Step	Task	Expected Results
12	SMOOTH	To select different filter periods for rising velocity and falling velocity. RISE Filtering of the rise velocity leads to noise suppression. FALL This filter leads for “prolongation” of the display flow.
13	FREQU.	It serves for selection of the Transmit Frequency which also depends on the Color-Box position.
14	ENSEMBLE	Controls the number of pulses to constitute one Color- or Power-Doppler line in the display.
15	DYNAMIC	Dynamic range refers to the compression of grayscale information into a suitable range for the display. It allows you to enhance an interesting part of the grayscale.
16	LINE DEN	Determines the line density within the Color-Box. The lower the line density, the larger the line distance and the size of the color pixels.
17	SCALE (CFM, TD)	The maximum velocities are displayed above and under the color scale in kHz, cm/s or m/s.
18	CFM-MAP (PD, TD)	Provides selectability of the color coding for an optimization of the display of blood flow (similar to the post-processing curves with grayscale 2D scans). After a selection has been made, the color bar displays the resultant map.
19	BALANCE	The Balance controls the amount of Color display over bright echoes and helps to confine color within the vessel walls.
20	ARTEFACT (on/off)	Switch on/off the artifact suppression.
21	BASELINE (up/down)	The baseline shift can be used to prevent aliasing in one flow direction similar to the Doppler baseline shift. There are 8 steps in each direction. (impossible in PD-Mode)

For further details refer to the Voluson® 730 Basic User Manual:

- Chapter 8, CFM-Mode (Color Flow Mode)
- Chapter 9, PD-Mode (Power Doppler Mode)
- Chapter 10, TD-Mode (Tissue Doppler Mode)

4-4-5 Volume Mode Checks

⚠ **NOTICE** Real Time 4D, RT_4D_Biopsy and VCI are Options.
If these options are not part of the system configuration, the appendant checks can be omitted.

NOTE: Different menus are displayed depending on which Touch Panel Menu and which Volume Mode (3D, Live 3D, Real-time 4D, Real-time 4D Biopsy, VCI) is selected.
Some function keys only appear on the Touch Panel if they are available for the selected Probe.

4-4-5-1 Pre-Volume Mode Functions

3D/4D

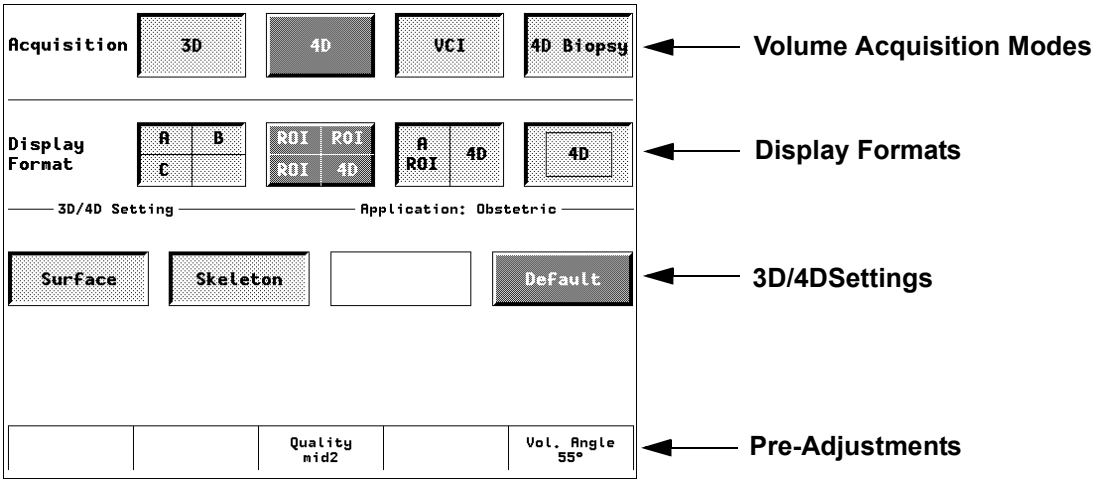


Figure 4-11 Pre-Volume Mode Menu

Table 4-7 Pre-Volume Mode Functions

Step	Task	Expected Results
1	3D	3D Volume Mode - Static volume acquisition (also possible in combination with PD-Mode)
2	4D	Real-time 4D - continuous volume acquisition and parallel calculation of 3D rendered images
3	LIVE 3D	Live 3D - continuous volume acquisition and parallel calculation of 3D rendered images
4	VCI	Volume Contrast Imaging improves the contrast resolution and therefore facilitates finding of diffuse lesions in organs
5	4D BIOPSY	Real-time 4D Biopsy continuous volume acquisition and parallel calculation of 3D rendered images
6	A B C	Display of Sectional Planes without 3D image.
7	ROI ROI ROI 4D	Quarter size display of Sectional Planes + rendered 3D image. (Note: The display of the Touch key depends on selected Acquisition Mode e.g. 4D.)
8	A ROI 4D	Dual size display of Sectional Planes + rendered 3D image. (Note: The display of the Touch key depends on selected Acquisition Mode e.g. 4D.)
9	4D	Full size display of a rendered 3D image. (Note: The display of the Touch key depends on selected Acquisition Mode e.g. 4D.)

Table 4-7 Pre-Volume Mode Functions

Step	Task	Expected Results
10	Volume Box Position and Volume Box Size	Adjust the Volume Box (ROI) Position resp. Size with the **TRACKBALL** in the B-Single image. The **upper trackball key** to change the Trackball function from Box Position to Box Size.
11	**QUALITY**	Changes the line density at the expense of the acquisition speed (low, mid1, mid2, high1, high2).
12	**VOL. ANGLE**	To select the Volume Sweep Angle.
13	Start Acquisition	Press the **FREEZE** key resp. the **right trackball key** to start the Volume acquisition.

4-4-5-2 Functions after the 3D Acquisition

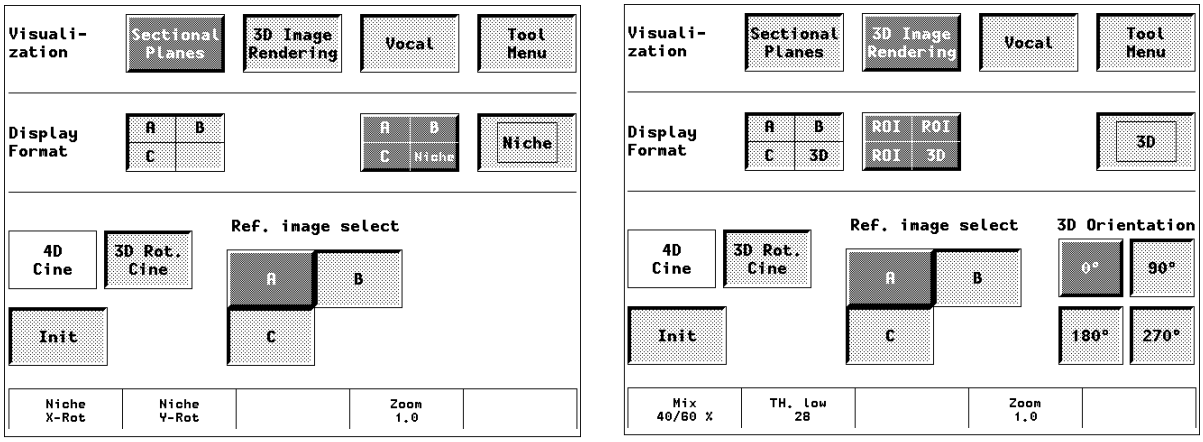
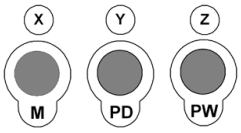
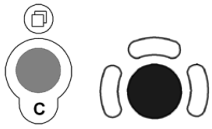
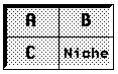


Figure 4-12 Sectional Planes and 3D Image Rendering

Table 4-8 Functions after the 3D Acquisition

Step	Task	Expected Results
1		**M-MODE** rotary control: Rotation about X-axis of the reference image. **PD-MODE** rotary control: Rotation about the Y-axis of the reference image. **PW-MODE** rotary control: Rotation about the Z-axis of the reference image.
2		**C-MODE** rotary control: Movement along Z-axis of the reference image. **TRACKBALL**: Movement along X- and Y-axis of the reference image.
3		Parts of the orthogonal sections A, B and C are complied to a 3D-section aspect. The aspect shows quasi a spatial cut into the reference image.
4	REF. IMAGE SELECT	To select the Reference image among A, B or C.
5	INIT	Resets the rotations and translations of a volume section to the initial (start) position.
6	3D ORIENTATION	To change the image orientation of the 3D-image as well as the sectional planes.
7	**ZOOM**	The 3D-image as well as the sectional planes can be varied by their aspect ratio.
8	**MIX**	To adjust the mix ratio between two calculated modes.

4-4-5 Volume Mode Checks (cont'd)

4-4-5-3 Functions in the Tool Menu

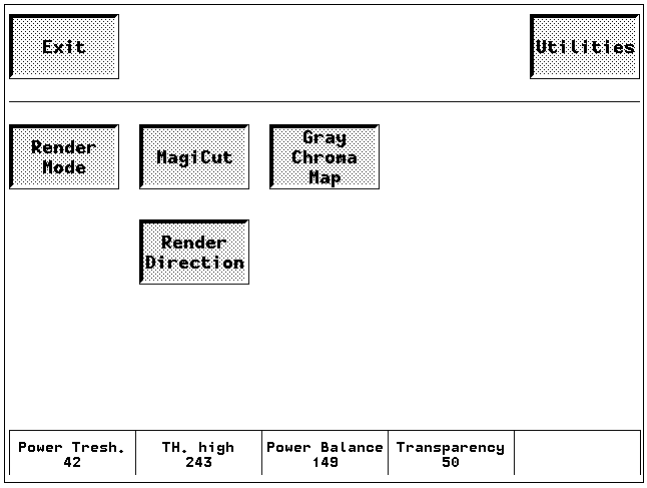


Figure 4-13 Tool Menu

Table 4-9 Functions in the Tool Menu

Step	Task	Expected Results
1	RENDER MODE	To select the Render Mode (Image Type and Render Algorithm)
2	MAGI CUT	Ability to electronically manipulate the images and cut way "3D artifacts".
3	GRAY CHROMA MAP	Depending on individual requirements a "harder" or "softer" image can be obtained.
4	RENDER DIRECTION	To select the desired Render Direction. The green line symbolizes the direction of the view.
5	**TH. LOW**	By changing the treshold all echoes below the level are enhanced in color to remove noise and to get a "clear sight". (Surface Mode only)
6	**TRANSPARENCY**	A higher number makes the gray scale information more transparent.

For further details refer to the Voluson® 730 Basic User Manual:

- Chapter 11.2, 3D Acquisition
- Chapter 11.3, 3D Image Rendering, Operation
- Chapter 11.5, Real Time 4D Acquisition
- Chapter 11.6, Live 3D Acquisition
- Chapter 11.7, Real Time 4D Biopsy
- Chapter 11.8, Volume Contrast Imaging (VCI)

4-4-6 Using Cine-Mode

4-4-6-1 Activating Cine

Press **FREEZE**, then roll the **TRACKBALL** to display the images of the stored sequence one by one.

4-4-6-2 Cine-Split Function (Multiple Format)

After **FREEZE** of a sequence in 2D-Mode two or four different images of the sequence can be displayed simultaneously in Dual respectively Quad Display Mode.

Move the **TRACKBALL** to display the images of the stored sequence. Use the **FORMAT** keys to change to the next (part of) frozen 2D-Image sequence to play back the cine memory.

NOTE: The Cine-Split function (multiple format) is also possible in 2D Auto Cine mode.

4-4-6-3 Activating 2D Auto Cine

1.) After Freeze touch the 2D CINE key on the Touch Panel.
2.) Select the **START IMAGE** of the sequence.The selected image is simultaneously displayed.
3.) Turn the **END IMAGE** digipot to the end of the sequence. The selected image is displayed.
4.) Select the review **SPEED** and the read **ZOOM** factor.
5.) Select the Cine Mode review direction.
6.) To start/stop the Cine Loop playback touch 2D CINE START/STOP.

After stopping the sequence, move the **TRACKBALL** to display the images one by one.

4-4-6-4 Spectral Doppler- or M-Cine Loop

Press **FREEZE**, then roll the **TRACKBALL** to display the Cine / Loop one by one.

The **UPPER TRACKBALL KEY** changes from the 2D-Cine to the D-Loop (respectively M-Loop).

*NOTE: The active Cine is displayed on the monitor screen: **2D**/D(M)-Image or 2D/**D(M)-Image.***

4-4-6-5 Activating 3D Rotation Cine

1.) After 3D Volume acquisition touch the 3D ROT. CINE key on the Touch Panel.
2.) Select the Rotation angle with the touch keys or select it manually with the **START IMAGE** and **END IMAGE** rotary controls.
3.) Select the Step angle and the Rotation axis.
4.) Touch the CALCULATE CINE SEQUENCE key to start the calculation.
5.) To start/stop the 3D Rotation Cine sequence touch START/STOP.

4-4-6-6 Activating 4D Cine

1.) After Real Time 4D acquisition touch the 4D CINE START/STOP key on the Touch Panel.
2.) Select the Cine Mode direction and the review **SPEED**.
3.) To start/stop the Real-time 4D sequence touch the 4D CINE START/STOP key again.

4-4-6-7 Activating Live 3D Cine

1.) After Live 3D acquisition touch the LIVE 3D CINE START/STOP key on the Touch Panel.
2.) Select the Cine Mode direction and the review **SPEED**.
3.) To start/stop the Live 3D sequence touch the LIVE 3D CINE START/STOP key again.

*NOTE: After stopping a 3D-, Real-Time 4D- or Live 3D sequence, move the **TRACKBALL** to display the images one by one.*

4-4-7 Basic Measurements

NOTE: Different menus are displayed depending on which Mode is selected.

General remarks to perform Basic measurements:

- By pressing the **MM** key on the control panel the Basic Measurement function is switched on.
- Positioning of measurement marks is done with the **TRACKBALL**.
- Entering and storage of measuring marks is done with **SET** (right or left trackball key).
- To change measuring marks before completion press **CHANGE** (upper trackball key).
- The status bar area shows the current function of the trackball.
- To erase measurement results, touch the DELETE key on the Touch Panel or press the **CLEAR ALL** key on the control panel.
- To exit from Basic measurements touch the EXIT key on the Touch Panel or press the **MM** key on the control panel.

*NOTE: The following instructions assume that you first scan the patient and then press **FREEZE**.*

4-4-7-1 Distance and Tissue DepthMeasurements (B- and M-Mode)

1.) Press the **MM** key once.
2.) Touch the appropriate item on the Touch Panel. An active cursor appears.
3.) To position the active cursor at the start point (distance) or the most anterior point (tissue depth), move the **TRACKBALL**.
4.) To fix the start point, press **SET** (the right or left trackball key). The system fixes the first cursor and displays a second active caliper.
5.) To position the second active caliper at the end point (distance) or the most posterior point (tissue depth), move the **TRACKBALL**.
6.) To complete the measurement, press **SET**. The system displays the distance or tissue depth value in the measurement results window.

Before you complete a measurement:

To toggle between active calipers, press **CHANGE** (upper trackball key).

To erase results, touch the DELETE key on the Touch Panel or press the **CLEAR ALL** key on the control panel.

*NOTE: The **CHANGE** key alternates the control from one cursor to the other.*

*NOTE: To exit Basic measurements, touch the EXIT key on the Touch Panel of press the **MM** key on the control panel.*

4-4-7 Basic Measurements (cont'd)

4-4-7-2 Circumference/Area (using Ellipse or Trace) Measurements

1.) Press the **MM** key once.
2.) Touch the corresponding item on the Touch Panel. An active cursor displays.
3.) To position the active cursor, move the **TRACKBALL**.
4.) To fix the start point, press **SET** (the right or left trackball key). The system fixes the first cursor and displays a second active caliper.
5.) To position the second caliper, move the **TRACKBALL** and press **SET** (Rt. / Lt. trackball key).

NOTE: If you have selected the 2D TRACE item, the measurement is finished and the area and circumference results appear on the screen.

6.) An ellipse appears the axis of which is defined by these two points.
To adjust the width of the ellipse, move the **TRACKBALL**.
7.) To toggle between calipers, press **CHANGE** (upper trackball key).
8.) To complete the measurement, press **SET** (right or left trackball key). The system displays the circumference and area in the measurement results area.

Before you complete a measurement:

- To erase the ellipse resp. trace and the current data measured, touch DELETE once. The original caliper is displayed to restart the measurement.
- To exit the measurement function without completing the measurement, touch **EXIT** on the Touch Panel or press the **MM** key again.

4-4-7-3 Volume Measurements

1.) Press the **MM** key once.
2.) Select the appropriate item among 1 DIST.; 1 ELLIP.; 3.DIST.; 1 DIST.+ELLIP.
3.) Perform the measurement(s) using the **TRACKBALL** and **SET** (right or left trackball key).
For further details: see 4-4-7-1 and 4-4-7-2.

4-4-7-3-1 3D Multi-Plane Measurements

NOTE: This volume measurement is only possible in 3D-Mode.

1.) Select the reference image in which the measurement is to be performed (A, B or C).
2.) Press the **MM** key once and select the 3D MULTI PLANE item.
3.) Select the first section through the body by rotating the **REF.SLICE** digipot below the Touch Panel or by rotating the **C-MODE** digipot. (first section should be set at the edge of the object)
4.) Position the start dot of the area which should be surrounded and store it with **SET**.
5.) Surround the area with the trackball, then press **SET** (right or left trackball key). The area is calculated and displayed. It may even be "zero". Press the **SET** key twice.
6.) Select the next parallel section with the **REF. SLICE** digipot or the **C-MODE** digipot, and measure the area.
7.) Repeat 5. and 6. until the edge of the measured object is reached.

NOTE: The contour of the measured area is not erased if a new section is adjusted. To call back the measured areas touch the PREV. respectively the NEXT key on the Touch Panel.

NOTE: To erase the results, touch the INIT key on the Touch Panel.

4-4-7 Basic Measurements (cont'd)

4-4-7-4 Velocity Measurements (Spectral Doppler Mode)

NOTE: The Spectral Doppler image is displayed based on time (X-axis) and velocity (Y-axis).

4-4-7-4-1 Acceleration Velocity and Velocity Ratio

1.) Press the **MM** key once.
2.) Select the appropriate item among D VELOCITY or D A/B.
3.) Perform the measurement(s) using the **TRACKBALL** and **SET** (right or left trackball key).

4-4-7-4-2 Average Velocity (Manual Trace)

1.) Press the **MM** key once.
2.) Touch D TRACE on the Touch Panel. A cursor appears on the screen.
3.) Move the cursor with the **TRACKBALL** to the start point of the measurement and press **SET** (right or left trackball key) to fix the marker.
4.) Trace to the end of the period and press the **SET** key again to fix the mark.
The measurement results appear on the screen.

Before you complete the measurement:

To readjust the traced line, press **UNDO** (upper trackball key) repeatedly.

NOTE: Depending on the setting in the Measure Setup, the envelope curve will be performed with a continuous trace line or by setting points.

4-4-7-4-3 Average Velocity (Auto Trace)

1.) Press the **MM** key once.
2.) Touch D AUTO TRACE on the Touch Panel.
It traces the Spectral Doppler image automatically and displays the results.
3.) Select the **SENSITIVITY** of the envelope curve (to eliminate artifacts).
4.) Select the **TRACE MODE** channel of the envelope curve (upper, both, lower).
5.) If necessary, select the Angle and the Baseline.
6.) Press the right or left trackball key to **FINISH** the measurement.

Before you complete the measurement:

- To readjust the start cycle (vertical yellow line), press **CHANGE** (upper trackball key). Press **SET** (right or left trackball key) to fix the line.
- Press the **CHANGE** key again to readjust the end cycle (vertical green line). Press **SET** to fix the line.

NOTE: The determination of the envelope curve requires a clear and low-noise record of the Doppler spectrum. Otherwise the reliability of the displayed measurement results may not be ensured!

4-4-8 Calculation Measurements

NOTE: Confirm that the patient information is correct and the probe and application are selected properly.

General remarks to perform Calculation measurements:

- By pressing the **CALC** key on the control panel the Calculation function is switched on.
- Positioning of measurement marks is done with the **TRACKBALL**.
- Entering and storage of measuring marks is done with **SET** (right or left trackball key).
- To change measuring marks before completion press **CHANGE** (upper trackball key).
- Depending on the setting in the Measurement Setup, also the **FREEZE** key can be used for confirming the last measuring mark of the currently performed measurement.
- The status bar area shows the current function of the trackball.
- To cancel the measurement of the currently selected item, touch CANCEL on the Touch Panel.
- To delete the results of the last measured item, touch UNDO LAST on the Touch Panel.
- To delete all measurement results of the selected group from the monitor as well as from the corresponding report, touch the CLEAR GROUP key on the Touch Panel.
- All measurement results will be automatically included in the corresponding patient report. (Except Auto Trace measurements; therefore you have to press the right or left trackball key **STORE**.)
- To erase results, press the **CLEAR ALL** key on the control panel.
- To exit from Basic measurements touch the EXIT key on the Touch Panel or press the **CALC** key.

4-4-8-1 OB Calculations

The most of items in the OB calculations are the measurement of a distance. see 4-4-7-1
The items that calculate the circumference include HC, AC and FTA. see 4-4-7-2
In case of AFI you can measure the distances in several images.
The ways for fetal doppler measurements are the same as those of basic velocity measurements.
For details see 4-4-7-4-2 and 4-4-7-4-3.

4-4-8-2 GYN Calculations

The ways of the measurement in the GYN Calculations are the same as those of distance see 4-4-7-1 and Spectral Doppler measurements see 4-4-7-4-2 and 4-4-7-4-3.
For details, refer to the Voluson® 730 Basic User Manual, Chapter 14.5, GYN Calculations.

4-4-8-3 Cardiac Calculations

This system allows measurements in B-Mode, M-Mode, Spectral Doppler Mode and Color Doppler Mode using different items of Cardiac Calculations.
For further details, refer to the Voluson® 730 Basic User Manual, Chapter 14.7, Cardiac Calculations.

4-4-8-4 Vascular Calculations

The way of Vascular Calculations such as Lt.ICA, Rt. ICA, Lt. CCA, Rt. CCA, Lt. ECA, Rt. ECA and Peripherals are the same.
For further details, refer to the Voluson® 730 Basic User Manual, Chapter 14.9, Vascular Calculations.

4-4-8-5 Report Pages

Press the Report key on the control panel to view a patient report that contains the results of Calculation Measurements. Any stored patient report can be edited, printed, transfered, saved to Sonoview or sent to DICOM server.

4-4-9 Probe/Connectors Usage

4-4-9-1 Connecting a probe

1.) Place the probe's carrying case on a stable surface and open the case.
2.) Carefully remove the probe and unwrap the probe cable.
3.) DO NOT allow the probe head to hang free. Impact to the probe head could result in irreparable damage.
4.) Turn the connector locking handle counterclockwise.
5.) Align the connector with the probe port and carefully push into place.
6.) Turn the connector locking handle clockwise to secure the probe connector.
7.) Open the right-hand side door, lay the cable into the intended cable holders and close the door. So it is free to move, but not resting on the floor.

4-4-9-2 Activating the probe

1.) Press the **PROBE** key to activate the “Probe Select” menu.
2.) Select the appropriate probe by touching the corresponding key.
3.) Upon selection of an “Application”, the programmed user presets appear.
4.) Touching a “Setting” key causes loading of the preset.

The probe activates in the 2D-Mode, the Touch Panel shows the main menu and the ultrasound image appears on the monitor in Write-Mode (real-time display).

4-4-9-3 Deactivating the probe

When deactivating the probe, the probe is automatically placed in standby mode (Read-Mode).

1.) Press the **FREEZE** key.
2.) Gently wipe the excess gel from the face of the probe. (Refer to the User’s Manual of the respective probe for complete cleaning instructions.)
3.) Carefully slide the probe around the right side of the keyboard, toward the probe holder. Ensure that the probe is placed gently in the probe holder.

4-4-9-4 Disconnecting the probe

Prior to disconnect a probe freeze the image. It is unnecessary to switch the unit off.

⚠ **CAUTION** **If a probe is disconnected while running (Write-Mode) a software error may occur. In this case switch the unit OFF (perform a reset).**

1.) Open the right-hand side door, remove the cable from the cable holder and close the door.
2.) Move the probe locking handle counterclockwise. Pull the probe and connector straight out of the probe port.
3.) Carefully slide the probe and connector away from the probe port and around the right side of the keyboard. Ensure the cable is free.

4-4-10 Image Management (Sonoview)

For Sonoview - Image Management functionality refer to the Voluson® 730 Basic User Manual. It talks about several topics:

- Clipboard
- Sending Exams
- Printing Exams / Images
- Export Exams / Images
- Backup Exams
- Restore the Backup Exams
- DICOM Print / Send
- Sending Images via e-mail
- Browsing and Managing an Exam's stored Image
- Connectivity, and Dataflow Concept and Creation
- Configuring Connectivity
- MO and CD-RW Formatting
- Services (Destinations)
- Buttons
- Views
- Verifying and Pinging a Device
- etc.

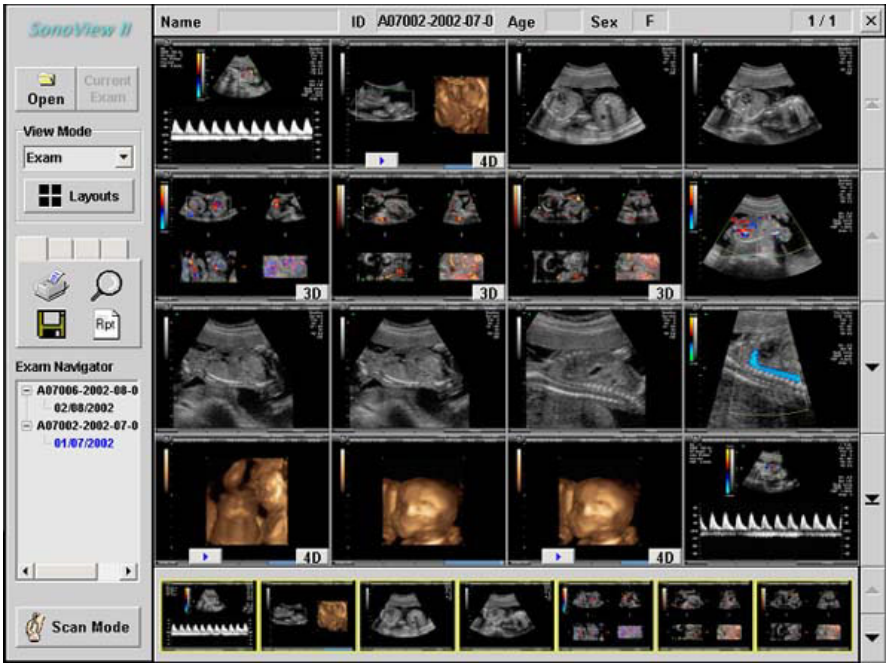


Figure 4-14 Sonoview

4-4-11 Using the MOD (Magneto-Optical Drive)

The 3.5 inch Magneto-Optical disk drive supports the following medias:

1.3GB; 640MB; 540MB; 230MB and 128MB

Figure 4-15 Magneto-Optical Drive

1.) Before installing an MO disk in the MOD, check the MO disk for loose hardware or damaged labels which could jam inside the MOD. Also, ensure that the slide switch in one corner of the disk is set so that the disk is write enabled (disk hole closed).

2.) Insert the disk into the MOD with the label facing up.

NOTICE **Never move the unit with a disk in the MOD because the drive actuator will not be locked and the MOD could break.**

3.) There are different methods to eject a disk from the MOD. Manual ejection methods are listed below in preferred order from best (1) to worst (3).

a.) Press the **EJECT** switch on the MOD while system is ON.

b.) Press and hold the **EJECT** switch while the system is booting.

c.) Mechanical ejection. Insert the end of a paper clip into the hole next to the **EJECT** switch while system power is OFF.

NOTICE **Avoid mechanical ejection whenever possible. Mechanical ejection leaves the actuator unlocked and the MOD susceptible to damage if moved. If forced to use this method, reboot the system, then insert and eject a known good disk using one of the other manual ejection methods.**

4-4-12 Backup and Restore Database, Preset Configurations and Images

4-4-12-1 Formatting Media

To format the backup media, MOD or CD-RW, press the **NETWORK** key on the Control panel. The Sonoview screen appears on the monitor; see: *Figure 4-14 on page 4-23*.

Note: The Image Management System **Sonoview** is an option.

a.) Select the “MO and CD-RW Formatting” tool on the left side of the Sonoview screen.
b.) Insert the medium and select the CD- or the MO-icon.

By selecting MO cartridge the unit displays the “MO Disk Formatter” window as shown in Figure 4-16.

1.) Select a Format Type from the drop down menu. If desired, mark the Low Level Format icon.
2.) Click the START button to start the formatting process.

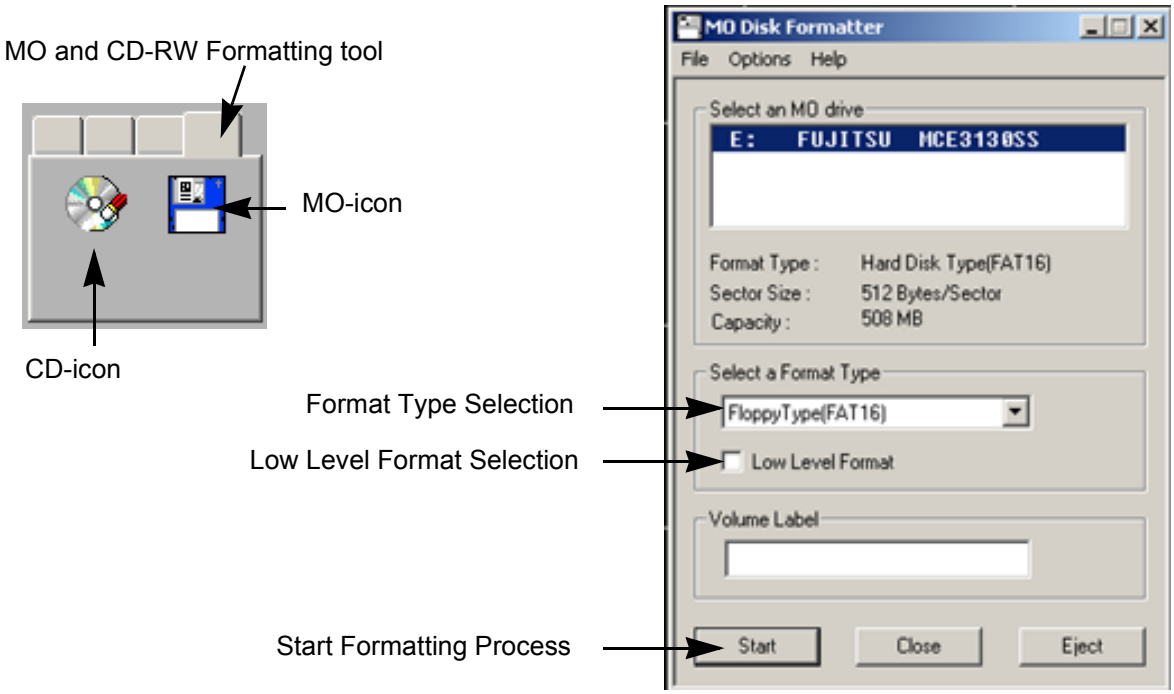


Figure 4-16 MO Disk Formatter Window

3.) A message box appears on the screen. Confirm with OK.
4.) When the formatting has been completed, click OK to continue.

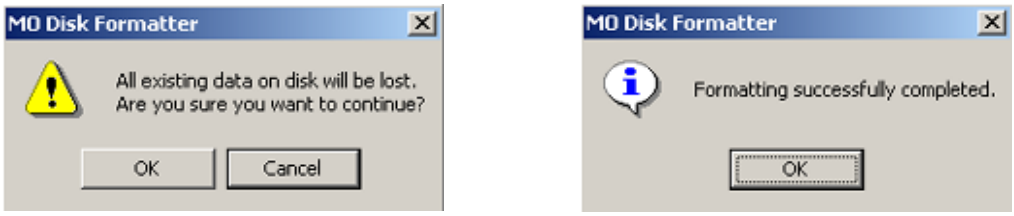


Figure 4-17 MO Disk Formatter messages

5.) Select the CLOSE key and touch the EXIT key on the Touch Panel to return to the Scan Mode.

4-4-12-1 Formatting Media (cont'd)

By selecting CD-RW the unit displays the "Erase CD-RW" window as shown in Figure 4-18.

1.) Select the "Erase Mode" and click the OK button to start the format process.

NOTICE It is highly recommended to use the complete erase mode, to avoid problems with the CD-RW!

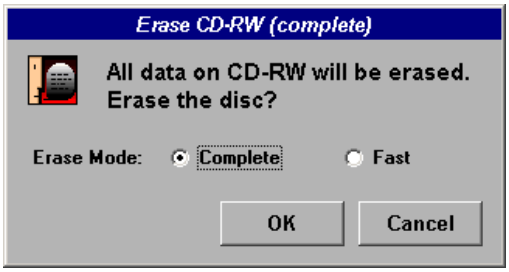


Figure 4-18 Erase CD-RW Window

2.) During erasing the Ultrasound system displays following message.

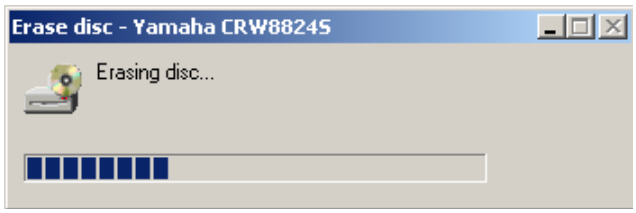


Figure 4-19 Erasing disk

3.) Touch the EXIT key on the Touch Panel to return to the Scan Mode.

NOTE: It is possible to adjust the Write Speed of the CD-Writer.
At older software versions, also the Erase Mode can be preset in the "Settings" window.

1.) Click the SETTINGS icon on the left side of the Sonoview screen.
2.) Select CD RECORDER from the tool bar.

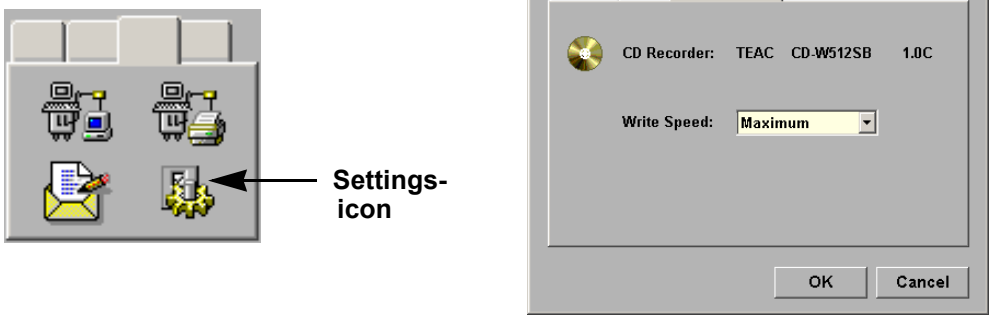


Figure 4-20 Settings of the CD-Recorder

3.) Choose the "Write Speed" (and the "Erase Mode" at systems with older software versions) from the corresponding pop-up menu.

4-4-12-2 Save System Presets and Configurations (Application Settings)

The Backup contains:

- User Settings, Auto Text, Measurement user tables
- Biopsy (needle guide positions)
- Setup settings (language, date format, screensaver on/off, etc.)

NOTE: Always backup any preset configurations before upgrading the Application Settings. This ensures that if the presets need to be reloaded, after the software update, will be the same ones the customer was using prior to service.

⚠ **NOTICE** Saving the Backup to CD-RW is impossible!

1.) Insert a formatted MOD (Magneto-Optical Disk) into the drive.
2.) On the Touch Panel, touch UTILITIES.
3.) On the Utilities Touch Panel, touch SYSTEM SETUP to invoke the setup desktop on the screen.
4.) Select the BACKUP page and click the SAVE button to display the Backup Save window.

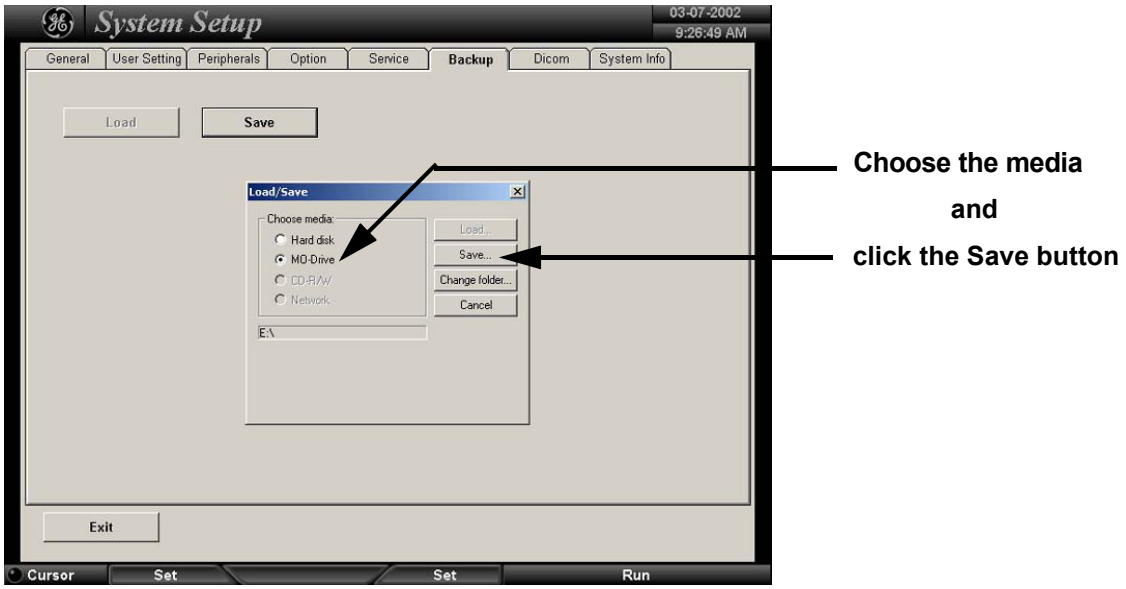


Figure 4-21 Backup Save window

5.) Choose the media (e.g.MO-Drive) and click the SAVE button.
6.) Select the NEW FILE... button and enter a file name (backup name - without extension).
7.) Click the OK button. The system performs the backup.
8.) When the saving of the System Settings has been completed, click OK.

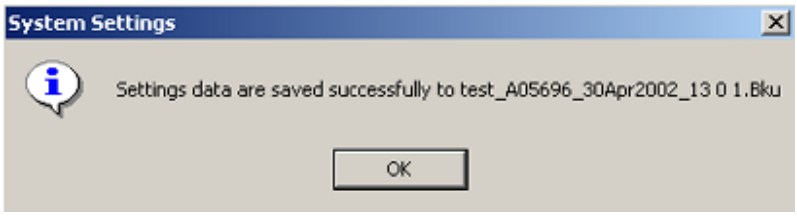


Figure 4-22 System Settings are saved successfully

4-4-12-3 Load System Presets and Configurations (Application Settings)

CAUTION Always backup any Application Settings before the upgrade; see: Section 4-4-12-2 on page 4-27. The loading procedure overwrites the existing application settings on the local hard drive. Make sure to insert the correct MOD or CD-RW. Additionally you can load the backup from d:\User Settings.

1.) If available, insert the Backup/Restore MOD (Magneto-Optical Disk) or CD-RW into the drive.
2.) On the Touch Panel, touch UTILITIES.
3.) In the Utilities menu, touch SYSTEM SETUP to invoke the setup desktop on the screen.
4.) Select the BACKUP page and click the LOAD button to display the Backup Load window.

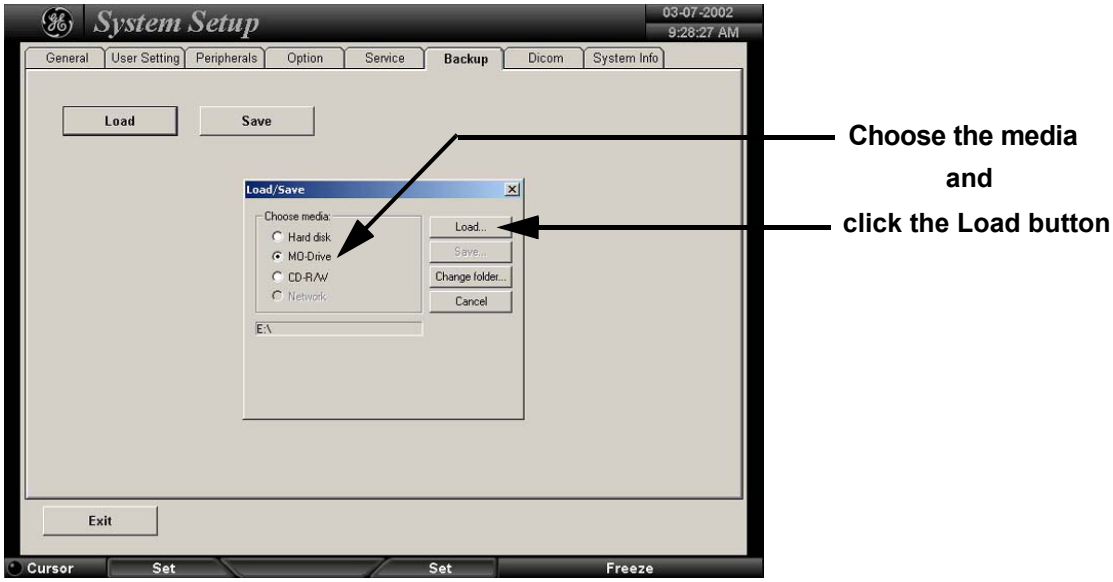


Figure 4-23 Backup Load window

5.) Choose the media (e.g. MO-Drive) and click the LOAD button.
6.) Select the appropriate file and click OK. The “Load Backup Data” window appears.

NOTICE If the selected Backup file doesn’t fit, a message box appears. see Figure 4-24
It is highly recommend to use Application settings which are adapted for the systems software version!

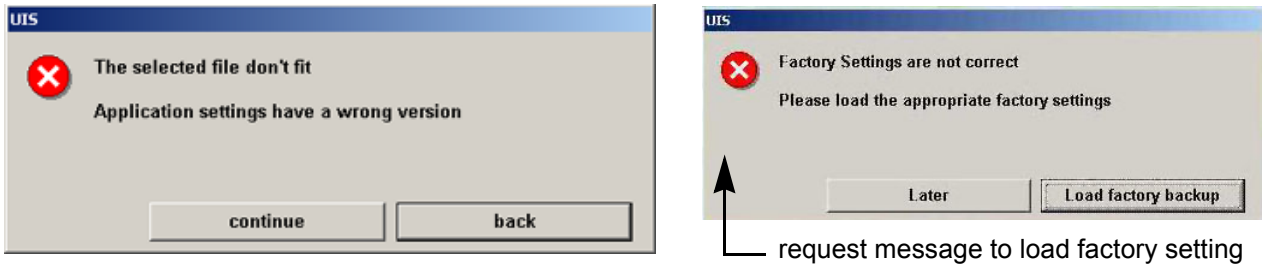


Figure 4-24 Wrong Version messages

NOTICE If you select the CONTINUE key to proceed loading the unfit Application settings, a request message (Figure 4-24) to load the appropriate factory settings will appear with each restart of the Voluson® 730.

4-4-12-3 Load System Presets and Configurations (Application Settings) (cont'd)

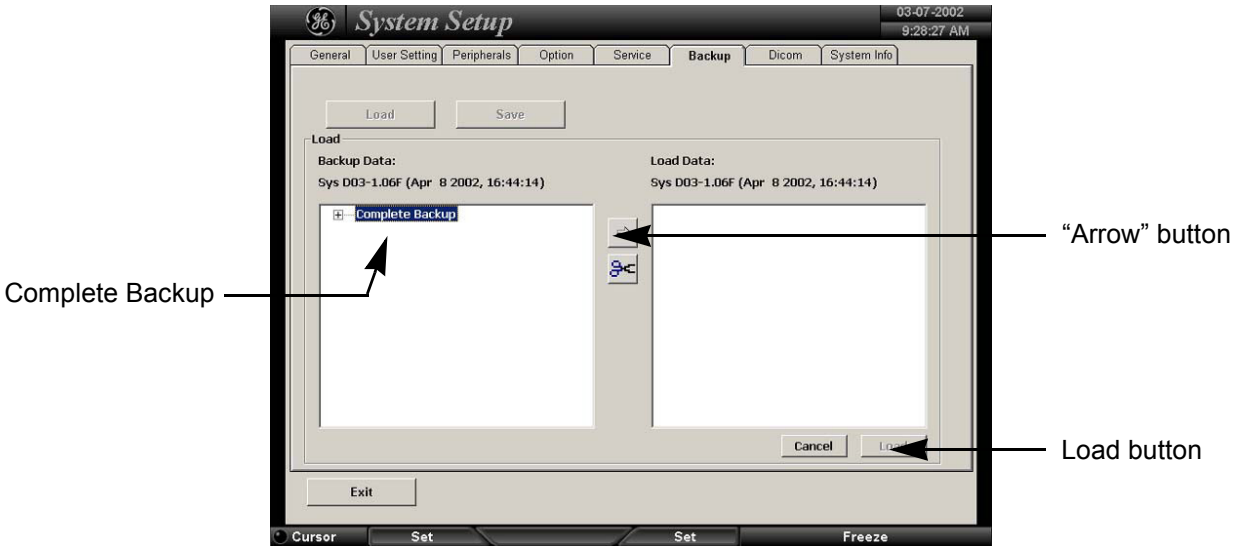


Figure 4-25 Load Backup Data

7.) Select the **Complete Backup** (marked blue) and click the ARROW button to copy the Complete Backup into the Load Data field.

8.) Click the LOAD button to start the loading procedure of the complete backup into the system.

NOTE: Also only parts of a Backup can be loaded into the database to overwrite, restore, copy, etc.... the database in the system.

1.) Click the + sign to open the content tree.

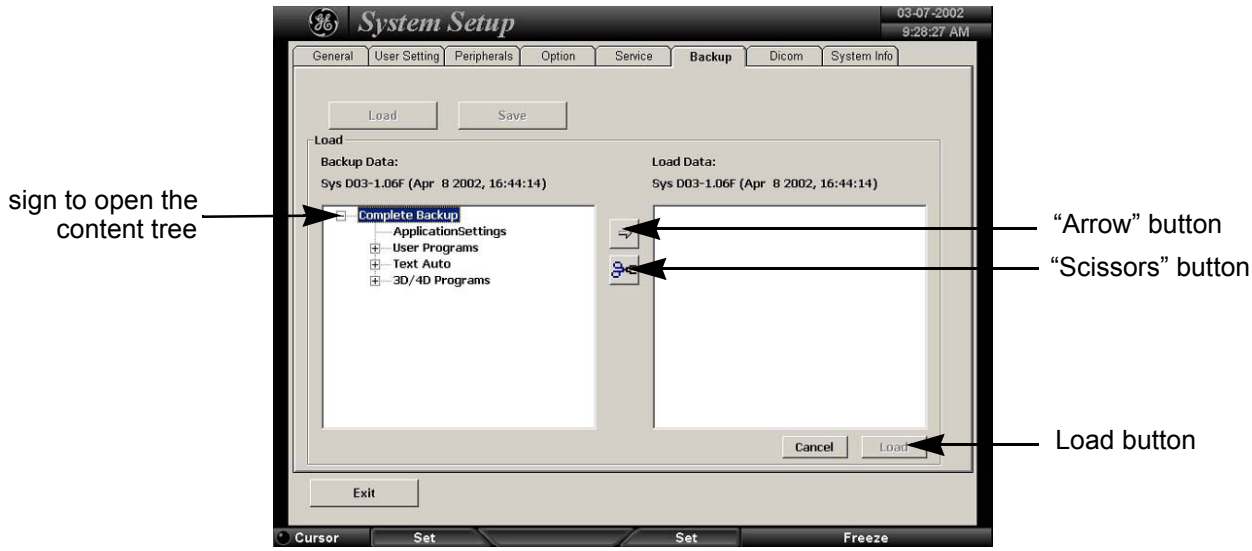


Figure 4-26 Load only parts of the Backup

2.) Click the ARROW button to copy the selected item into the Load Data field.

3.) To return selected items from the Load Data field to Backup Data field select the SCISSORS button.

4.) Click the LOAD button to start loading procedure of the selected Backup item into the system.

4-4-12-4 Archiving Images

1.) Insert the archive media.

2.) Press the **NETWORK** (Sonoview) key on the Control panel.

3.) Format the MOD/CD-RW. To format the media, CD-RW or MOD see Section 4-4-12-1 "Formatting Media" on page 4-25.

4.) When you click the OPEN button on the upper left side of the screen, a list of all the exams is displayed see Figure 4-27.

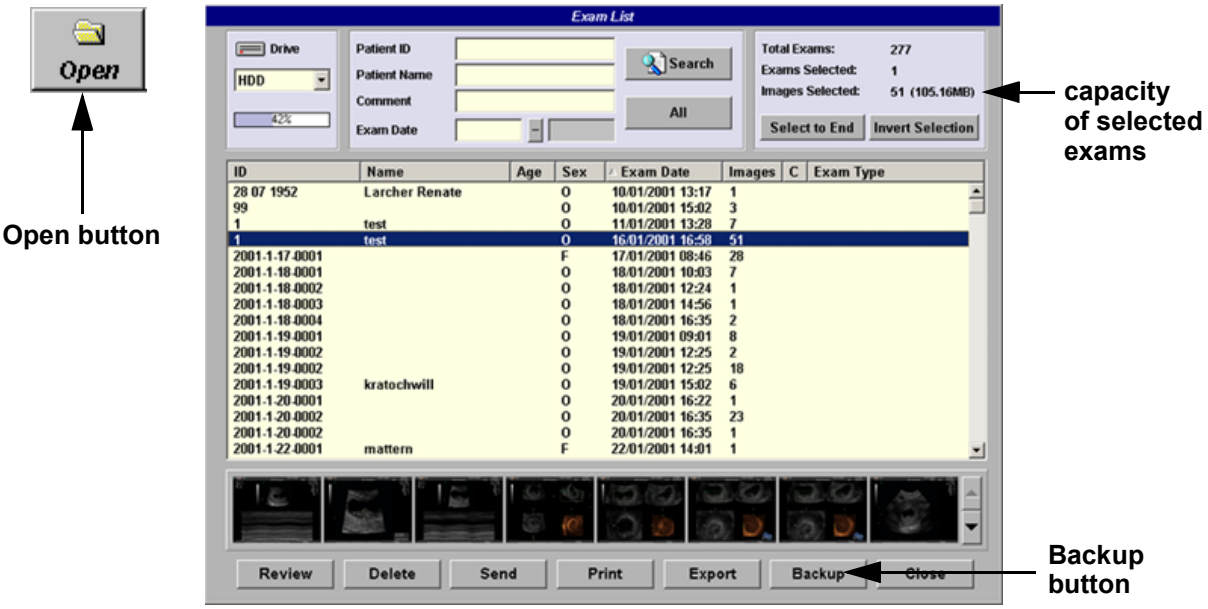


Figure 4-27 Sonoview Screen

5.) Select the exam(s) using the **TRACKBALL** and the right trackball key **SET**.

NOTE: The number of all exams of the exam list, the number of currently selected exams, the number of images and the capacity of selected images are displayed automatically at the right and upper corner of the exams list.

6.) Click the BACKUP button.

7.) Select on which medium you would like to Backup the files.

8.) After finishing the backup, select whether the selected exam(s) is to be deleted or not.

Figure 4-28 Backup windows

⚠ **NOTICE** If you select to delete the exam after finishing the backup, it will be absolutely deleted from the hard disk of the ultrasound scanner Voluson® 730!

4-4-13 ECG Check Out

Connect the ECG-preamplifier MAN and check:

Table 4-10 ECG-preamplifier Check

Step	Task	Expected Result(s)
1	Connect the ECG at the Connector on the rear panel of the scanner. Touch the UTILITIES key, then the ECG key on the Touch Panel.	It will display a curve along the bottom edge of the image sector

Section 4-5
Software Configuration Checks

Touch the UTILITIES key, then touch SYSTEM SETUP. The System Setup desktop offers different pages to check:

Table 4-11 Software Configuration (System Setup) Checks

Step	Task	Expected Result(s)
1	General: Check Date and Time setting	Date and Time are correct
2	General: Check that Location (Clinic Name) is correct	Location Name is correct
3	General: Check Language settings	desired Language is displayed
4	User Setting: Check all the User Settings	settings assigned as desired by the customer
5	Peripherals: Check assignment of Printer Keys	Print A and Print B keys are assigned as desired by the customer
6	Peripherals: Check assignment of Foot Switch	Foot Switch left and right are assigned as desired by the customer
7	Peripherals: Check Save Destination assignment	assigned as desired by the customer
8	Peripherals: Check 2D Save key assignment	assigned as desired by the customer
9	Peripherals: Check Remote Print A, Remote Print B, Report Printer and DICOM Print Job assignment	settings assigned as desired by the customer
10	Option: Check that all of the options are set up correct	all authorized functions are enabled

Touch the UTILITIES key, then touch MEASURE SETUP.
The Measurement Setup desktop offers different pages to check:

Table 4-12 Measurement Setup Checks

Step	Task	Expected Result(s)
1	General: Check “2D Circumference and Area Method”	setting assigned as desired by the customer
2	General: Check “Show Caliper Information Text”	setting assigned as desired by the customer
3	General: Check “Caliper & Measure-Result Font Size”	setting assigned as desired by the customer
4	General: Check “Doppler Manual Trace Mode”	setting assigned as desired by the customer

Table 4-12 Measurement Setup Checks

Step	Task	Expected Result(s)
5	General: Check “Store Measurements”	setting assigned as desired by the customer
6	General: Check “Doppler Trace Display Results”	settings assigned as desired by the customer
7	General: Check “Measure Results Display”	setting assigned as desired by the customer
8	OB: Check “Preset Selection”	setting assigned as desired by the customer
9	OB: Check “Pregnancy Weeks”	setting assigned as desired by the customer
10	OB: Check “Ratio Calculations”	settings assigned as desired by the customer
11	OB: Check “GS Measurement Method”	setting assigned as desired by the customer
12	OB: Check “Show Author´s Name at Measure Menu”	setting assigned as desired by the customer
13	Cardiac: Check “2D Circumference and Area Method”	setting assigned as desired by the customer
14	Cardiac: Check “LV Volume Calculation Method”	setting assigned as desired by the customer

Section 4-6
Peripheral Checks

Check that peripherals work as described below:

Table 4-13 Peripheral Checks

Step	Task to do	Expected Result(s)
1	Press the **FREEZE** key.	Stop image acquisition.
2	Press the **PRINT A** or **PRINT B** key on the Control Panel.	The image displayed on the screen is printed on B&W or Color printer, depending on the key assignment configuration
3	Press the **VCR** key on the Control Panel twice.	VCR starts recording (REC - will be displayed on the screen)
4	Press the **VCR** key twice again.	VCR stops recording
5	Press the **VCR** key on the Control Panel once.	The VCR Remote Control menu is displayed on the Touch Panel.
6	Press RECORD on the Touch Panel.	to start recording A red dot is displayed in the *VCR status area* on the *Title bar* to indicate that recording has begun
7	Press STOP on the Touch Panel.	To Stop recording The video status icon is changed to (Pause)
8	Press PLAY on the Touch Panel.	To start, Play back an examination
9	Press EXIT on the Touch Panel	to return to the scanning mode
10	Use the **assignable keys** on the Touch Panel	to perform actions on the recorded session, such as stop, pause, rewind or fast forward. The video status icon in updated accordingly.

Section 4-7
Mechanical Function Checks

4-7-1 Rotation of the Control Console

Figure 4-29 Locking Lever under Control Console

Table 4-14 Rotation of the Control Console

Step	Task	Expected Result(s)
1	Push the locking lever under the Control Console forward, grasp it at the front grip of the user interface and rotate the console.	It is possible to rotate the Control Console up to 30° to the right.

⚠ **WARNING** ***Do not put your hand between the control console and the main unit when moving the console to the 0° position: Danger of injuries!***

4-7-2 Brakes and Direction Locks

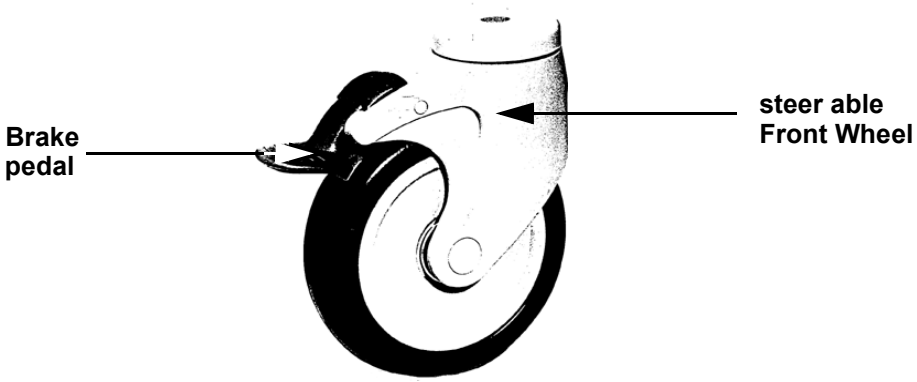


Figure 4-30 Front Wheel with Brake

Table 4-15 Brakes and Direction Lock

Step	Task	Expected Result(s)
1	Flap the foot rest up and press the release brake pedals on the front wheels.	The front wheels are engaged / disengaged for transportation.

4-7-3 Power Supply Adjustment

There are no adjustments on the power supplies. The DC Power is self-regulated. If a voltage is outside the specified range, it means that something is wrong, either with the power supply itself or with a component connected to that specific power outlet.

Section 4-8
Site Log

4-8-1 Site Log - System (Service Database)

1.) On the Touch Panel, touch UTILITIES.
2.) In the Utilities menu, touch SYSTEM SETUP to invoke the setup desktop on the screen.
3.) Select the SERVICE page. The “password window” appears automatically.
4.) Enter the password SHE and click the ACCEPT button to display the Service Tools window.

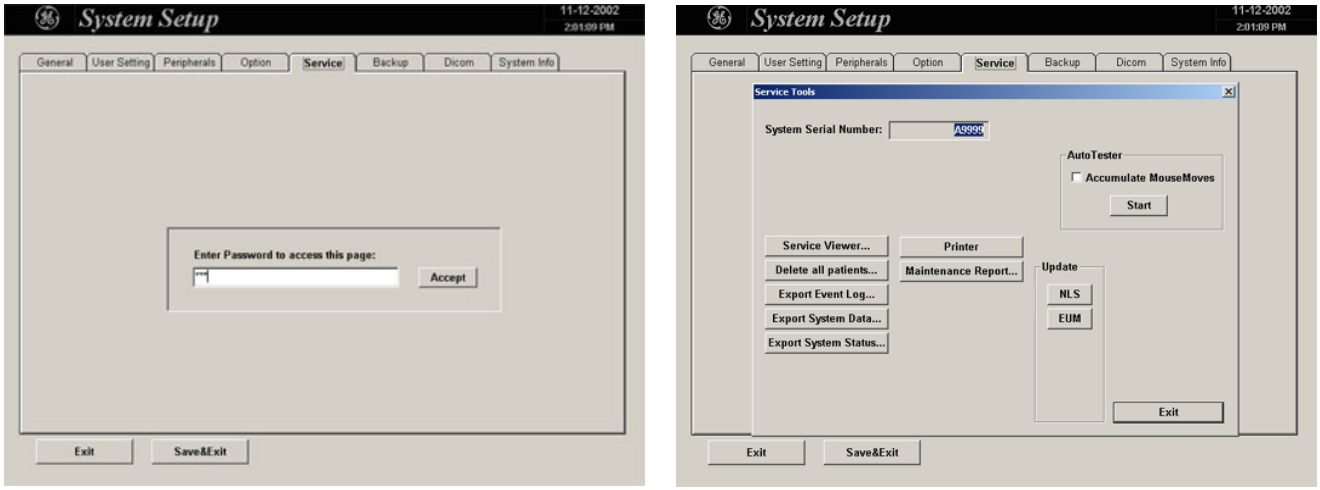


Figure 4-31 System Setup Service page and Service Tools window

5.) Click the MAINTENANCE REPORT button. The following message box will be displayed.

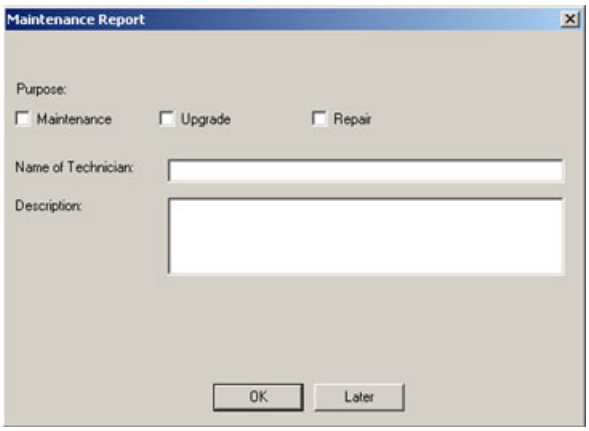


Figure 4-32 Maintenance Report

6.) Fill in the requested information and click OK.
7.) Click the EXIT button on the Service Tools window and the EXIT button on the System Setup Service page.

NOTE: After Hardware or Software modifications normally the “Maintenance Report” message box (see: Figure 4-32) appears automatically on the screen.

4-8-2 Site Log - Paper Documentation

Table 4-16 Site Log

Date	Service person	Problem	Comments

Chapter 5
Components and Functions (Theory)

Section 5-1
Overview

5-1-1 Purpose of Chapter 5

This chapter explains Voluson® 730's system concepts, component arrangement, and subsystem function. It also describes the Power Distribution System (PDS) and probes.

Table 5-1 Contents in Chapter 5

Section	Description	Page Number
5-1	Overview	5-1
5-2	General Information	5-2
5-3	Main board Chassis GEF Module	5-18
5-4	Front End Processor	5-19
5-5	Back End Processor	5-24
5-6	Internal I/O	5-28
5-7	Top Console	5-31
5-8	Monitor	5-32
5-9	External I/O	5-33
5-10	Peripherals	5-34
5-11	Power Distribution	5-35
5-12	Mechanical Descriptions	5-37
5-13	Air Flow Control	5-40
5-14	Service Page	5-41

Section 5-2
General Information

Voluson® 730 is a digital beam forming curved-, linear- and phased array ultrasound imaging system. It has provisions for analog input sources like ECG and Phono. A CW-Doppler probe may also be connected and used.

The system can be used for:

- 2D Gray Scale and 2D Color Doppler Imaging (CFM, PD, TD)
- M-Mode Gray Scale Imaging
- Doppler (PW, CW)
- 3D Mode and Real Time 4D Imaging
- Different combinations of the above modes

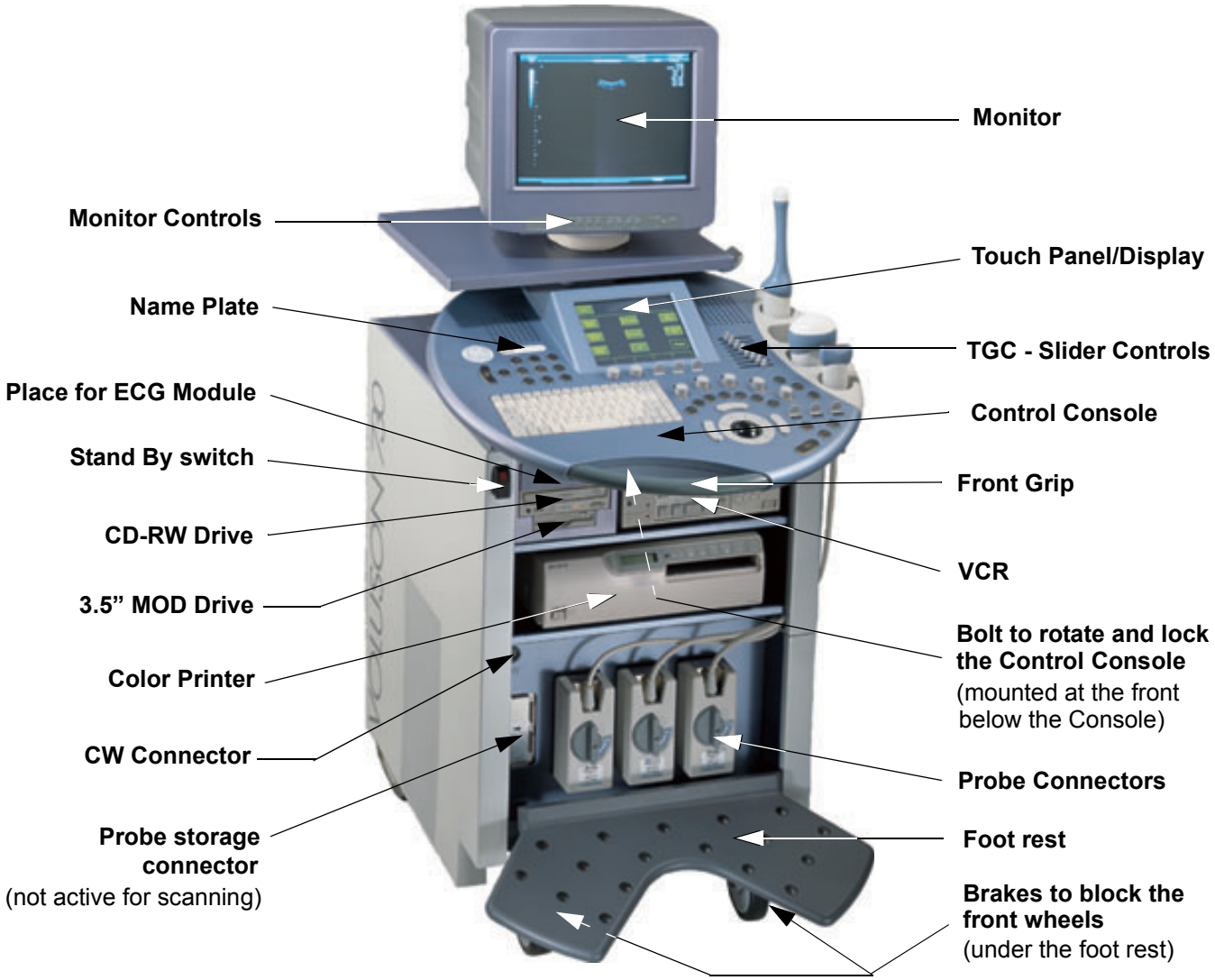


Figure 5-1 Voluson® 730 Major Components

Section 5-2 General Information (cont'd)

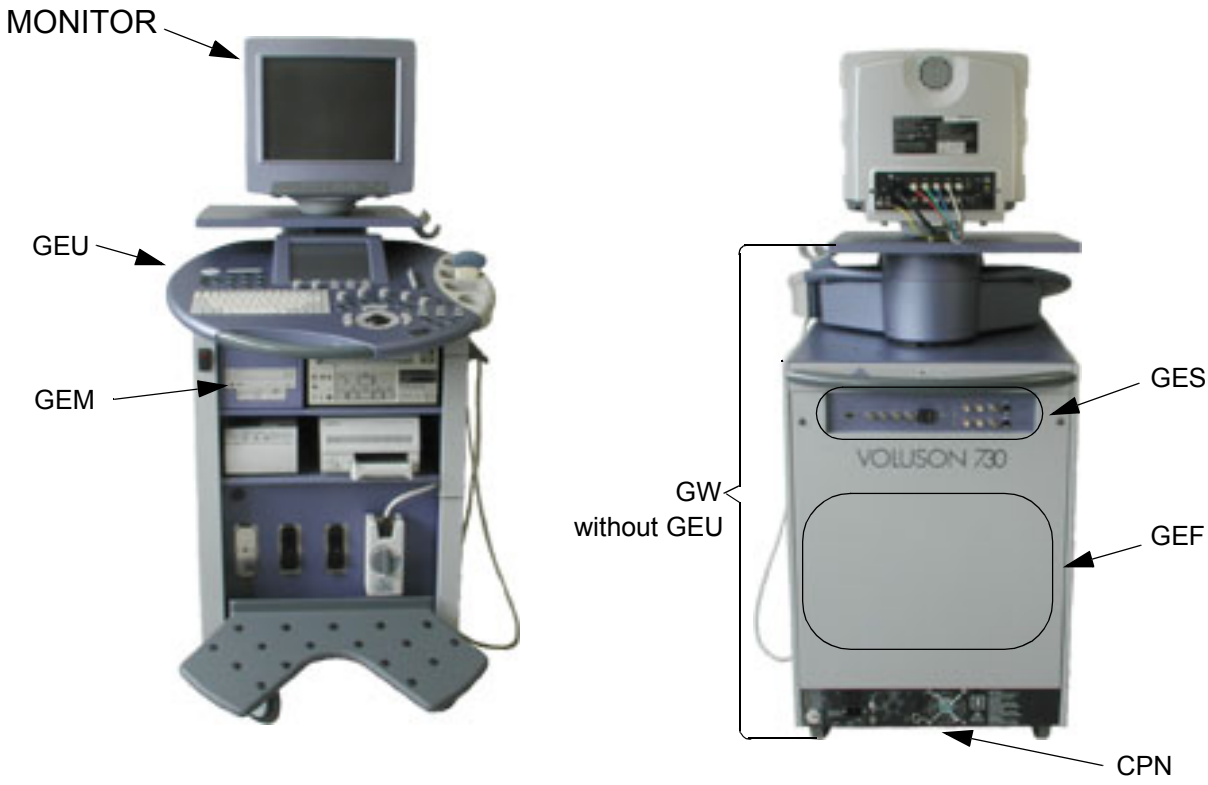


Figure 5-2 Major System Components

Major System Components:

- GEF: Main Board Chassis: Section 5-3 on page 5-18
  - Front-End processor Section 5-4 on page 5-19
  - Back-End processor Section 5-5 on page 5-24
- GEU: Top Console User interface (System I/O with hard keys, Touch screen and EL-Display) Section 5-7 on page 5-31
- MONITOR: Section 5-8 on page 5-32
- GES: External I/O Connection Module Section 5-9 on page 5-33
- GEM: Removable Disk drive module (ECG-preamplifier MAN6 - optional) Section 5-10 on page 5-34
- CPN: Primary Power supply and Isolation transformer for the peripherals Section 5-11 on page 5-35
- GW: System mechanical chassis, stand alone trolley to keep all major components Section 5-12 on page 5-37

Section 5-2 General Information (cont'd)

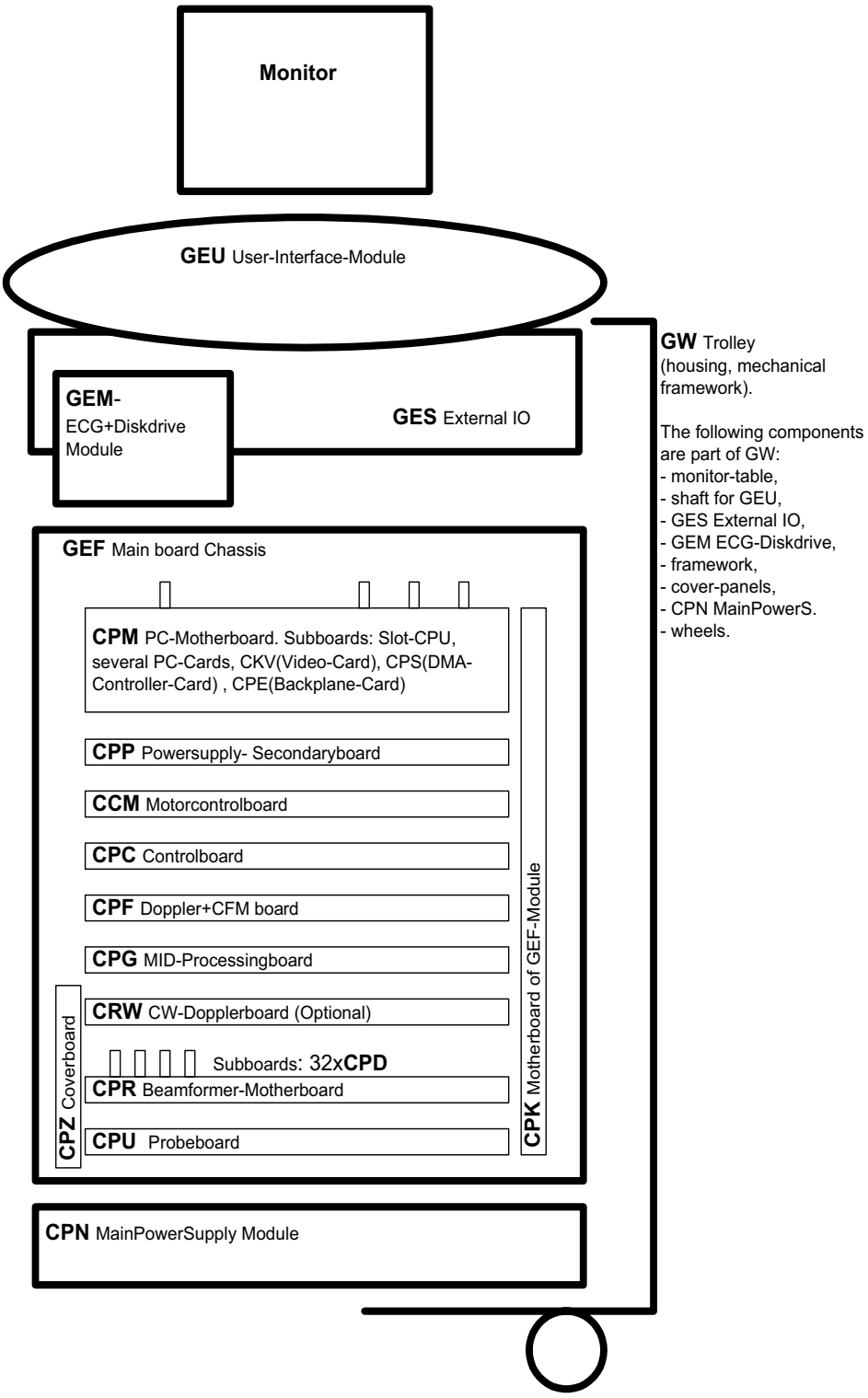


Figure 5-3 Basic Blockdiagram of Voluson® 730

Section 5-2 General Information (cont'd)

The Voluson® 730 used digital beam forming technology which provides high resolution and high penetration performance. It is a general purpose, mobile, software controlled diagnostic ultrasound scanner. Its function is to acquire ultrasound data and to display the data of different modes. Voluson® 730 gives the operator the ability to measure anatomical structures and offers analysis packages that provide information that is used to make a diagnosis by competent health care professionals.

The Calculation and Report function supports 4 application packages:

- Obstetric Calculations
- Gynecology Calculations
- Cardiology Calculations
- Vascular Calculations
-

The Voluson® 730 supports a variety of linear-, curved-, phased array and pencil probes for various clinical applications. Any three probes may be connected at the same time (+ one pencil CW-probe).

Medical application fields include:

- Obstetrics
- Gynecology and Fertility
- Radiology
- Internal Medicine
- Neurology
- Cardiology
- Oncology
- Urology
- Orthopedics
- Pediatrics

The system is designed for follow-up expansion.

In addition to the initial operational settings for each transducer pre-programmed in the system, user-customized parameter settings for each transducer may be inserted by the operator and stored for recall as needed via the system control panel. System configuration is stored on the hard drive and all necessary software is loaded from the hard drive on power up.

Biopsy guidelines are provided on screen to assist in the collection of tissue samples, using biopsy guide adapters offered as an optional accessory.

The system provides the ability to perform remote viewing of images without compression, via DICOM 3.0 compatible output. Management of patient history is possible by "Sonoview" image-filing function. High-resolution images are provided by utilizing a technology called digital dynamic receive focusing.

Signal flow travels from the Probe Connector Panel to the Front End Electronics, to the Back-End Processor, and finally displayed on the monitor and peripherals.

For more detailed explanations of functions and controls refer to the Voluson® 730 Basic User Manual.

5-2-1 Description of Voluson® 730 Operating Modes

5-2-1-1 B-Mode or 2D-Mode:

B-Mode or 2D-mode is a two-dimensional image of the amplitude of the echo signal. It is used for location and measurement of anatomical structures and for spatial orientation during operation of other modes. In 2D-mode, a two-dimensional cross-section of a three-dimensional soft tissue structure such as the heart is displayed in real time. Ultrasound echoes of different intensities are mapped to different gray scale or color values in the display. The outline of the 2D cross-section may be a rectangle, parallelogram, sector or 360-degree circle, depending on the particular transducer used. 2D-mode can be used in combination with any other mode.

5-2-1-2 M-Mode:

In M-mode, soft tissue structure is presented as scrolling display, with depth on the Y-axis and time on the X-axis. It is used primarily for cardiac measurements such as value timing on septal wall thickness when accurate timing information is required. M-mode is also known as T-M mode or time-motion mode. Ultrasound echoes of different intensities are mapped to different gray scale values in the display. M-mode displays time motion information of the ultrasound data derived from a stationary beam. Depth is arranged along the vertical axis with time along the horizontal axis. M-mode is normally used in conjunction with a 2D image for spatial reference. The 2D image has a graphical line (M-line) superimposed on the 2D image indicating where the M-mode beam is located.

5-2-1-3 Color Doppler Mode:

Color Doppler is used to detect motion presented as a two-dimensional display.
There are three applications of this technique:

- Color Flow Mode (C) - used to visualize blood flow velocity and direction
- Power Doppler (PD) - used to visualize the spatial distribution of blood
- Tissue Doppler (TD) - used to visualize tissue motion direction and velocity (optional see 5-2-5-8)

5-2-1-3-1 Color Flow Mode:

a real-time two-dimensional cross-section image of blood flow is displayed. The 2D cross-section may be presented as a rectangle, parallelogram, trapezoid, sector, or a full circle, depending on the particular transducer used. The 2D cross-section is presented as a full color display, with various colors being used to represent blood flow (velocity, variance, power and/or direction). Often, to provide spatial orientation, the full color blood flow cross-section is overlaid on top of the grayscale cross-section of soft tissue structure (2D echo). For each pixel in the overlay, the decision of whether to display color (Doppler), gray scale (echo) information or a blended combination is based on the relative strength of return echoes from the soft tissue structures and from the red blood cells. Blood velocity is the primary parameter used to determine the display colors, but power and variance may also used. A high pass filter (wall filter) is used to remove the signals from stationary or slowly moving structures. Tissue motion is discriminated from blood flow by assuming that blood is moving faster than the surrounding tissue, although additional parameters may also be used to enhance the discrimination. Color flow can be used in combination with 2D and Spectral Doppler modes.

5-2-1-3-2 Power Doppler:

a real-time two dimensional cross-section of blood flow is displayed. The 2D cross-section may be presented as a rectangle, parallelogram, trapezoid, sector, or a full circle, depending on the particular transducer used. The 2D cross-section is presented as a full color display, with various colors being used to represent the power in blood flow echoes. Often, to provide spatial orientation, the full color blood flow cross-section is overlaid on top of the gray scale cross-section of soft tissue structure (2D echo). For each pixel in the overlay, the decision of whether to display color (Doppler power), gray scale (echo) information or a blended combination is based on the relative strength of return echoes from the soft-tissue structures and from the red blood cells. A high pass filter (wall filter) is used to remove the signals from stationary or slowly moving structures.

Tissue motion is discriminated from blood flow by assuming that blood is moving faster than the surrounding tissue, although additional parameters may also be used to enhance the discrimination. The power in the remaining signal after wall filtering is then averaged over time (persistence) to present a steady state image of blood flow distribution. Power Doppler can be used in combination with 2D and Spectral Doppler modes as well as with 3D mode.

5-2-1-4 Pulsed (PW) Doppler:

PW Doppler processing is one of two spectral Doppler modalities, the other being CW Doppler. In spectral Doppler, blood flow is presented as a scrolling display, with flow velocity on the Y-axis and time on the X-axis. The presence of spectral broadening indicates turbulent flow, while the absence of spectral broadening indicates laminar flow. PW Doppler provides real time spectral analysis of pulsed Doppler signals. This information describes the Doppler shifted signal from the moving reflectors in the sample volume. PW Doppler can be used alone but is normally used in conjunction with a 2D image with an M-line and sample volume marker superimposed on the 2-D image indicating the position of the Doppler sample volume. The sample volume size and location are specified by the operator. Sample volume can be overlaid by a flow direction cursor which is aligned, by the operator, with the direction of flow in the vessel, thus determining the Doppler angle. This allows the spectral display to be calibrated in flow velocity (m/sec) as well as frequency (Hz). PW Doppler also provides the capability of performing spectral analysis at a selectable depth and sample volume size. PW Doppler can be used in combination with 2D and Color Flow modes.

5-2-2 3D Imaging

The Voluson® 730 Ultrasound System will be used to acquire multiple, sequential 2D images which can be combined to reconstruct a three dimensional image. These 3D images are useful in visualizing three-dimensional structures, and in understanding the spatial or temporal relationships between the images in the 2D sequence. The 3D image is presented using standard visualization techniques, such as surface or volume rendering.

5-2-2-1 3D Data Collection and Reconstruction:

2D gray scale including Power Doppler images may be reconstructed. The acquisition of volume data sets is performed by sweeping 2D-scans with special transducers (called 3D-transducers) designed for the 2D-scans and the 3D-sweep.

Images are spatially registered, using internal probe position sensing and a position control to ensure geometric accuracy of the 3D data.

2D ultrasound imaging modes are used to view a two dimensional cross-sections of parts of the body. For example in 2D gray scale imaging, a 2 dimensional cross-section of a 3-dimensional soft-tissue structure such as the heart is displayed in real time. Typically, the user of an ultrasound machine manipulates the position and orientation of this 2D cross-section in real time during an ultrasound exam. By changing the position of the cross-section, a variety of views of the underlying structure are obtained, and these views can be used to understand a 3-dimensional structure in the body.

To complete survey a 3-dimensional structure in the body, it is necessary to collect 2D images which span a volume containing the structure. One way is to sweep the imaging cross-section by translating it in a direction perpendicular to the cross-section. Another example method is to rotate the cross section about a line contained in the cross section. The Voluson® 730 Ultrasound System uses the automated so called C-Scan for the motion perpendicular to automated B-scan.

Once a representative set of 2D cross-sections are obtained, standard reconstruction techniques can be used to construct other 2D cross-sections, or to view the collection of the cross-sections as a 3D images.

5-2-2-2 3D Image Presentation:

The basic technique for 3D image presentation is to combine the 2D cross –sections into an image which represents how the volume of the data would appear from a particular viewing direction. The mathematics behind this feature is called 3D-rendering. Such combined images are called projections, because the data from the volume is projected onto a flat 2-dimensional surface(e.g. the ultrasound system display.) This technique can be applied to any 2D ultrasound mode.

Several techniques can be used to aid the human observer in understanding the resulting 2D image as a representation of a three-dimensional object. One is to rotate the volume of data, and present the resulting sequence of 2D projections to the observer. The changing direction of observation helps the observer to separate the features in the volume according to their distance from the observer.

5-2-2-3 3D Rendering:

The 3D (volume) rendering is a calculation process to visualize certain 3D-structures of a scanned volume by means of a 2D-image. The gray value for each pixel of the 2D-image is calculated from the voxels along the corresponding projection path (analyzing beam) through the volume. The render (calculation) algorithm, surface or transparent mode, determines how 3D-structures are visualized.

With the MagiCut function it is possible to cut off “3D artifacts” which hide regions that are of interest for the diagnostic purpose.

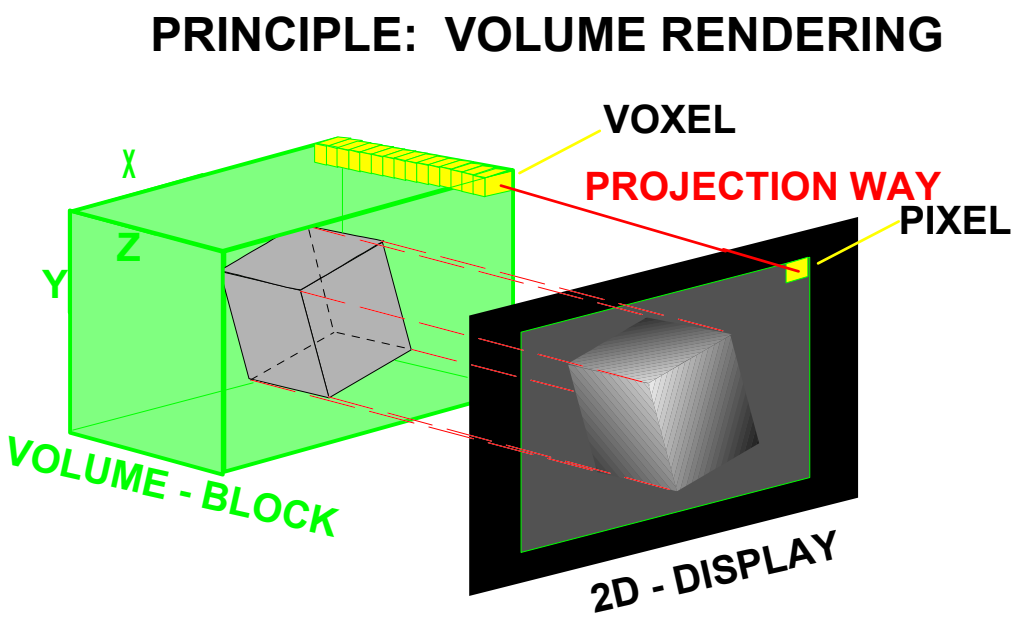


Figure 5-4 Principle of Volume Rendering

5-2-3 Blockdiagram Voluson® 730

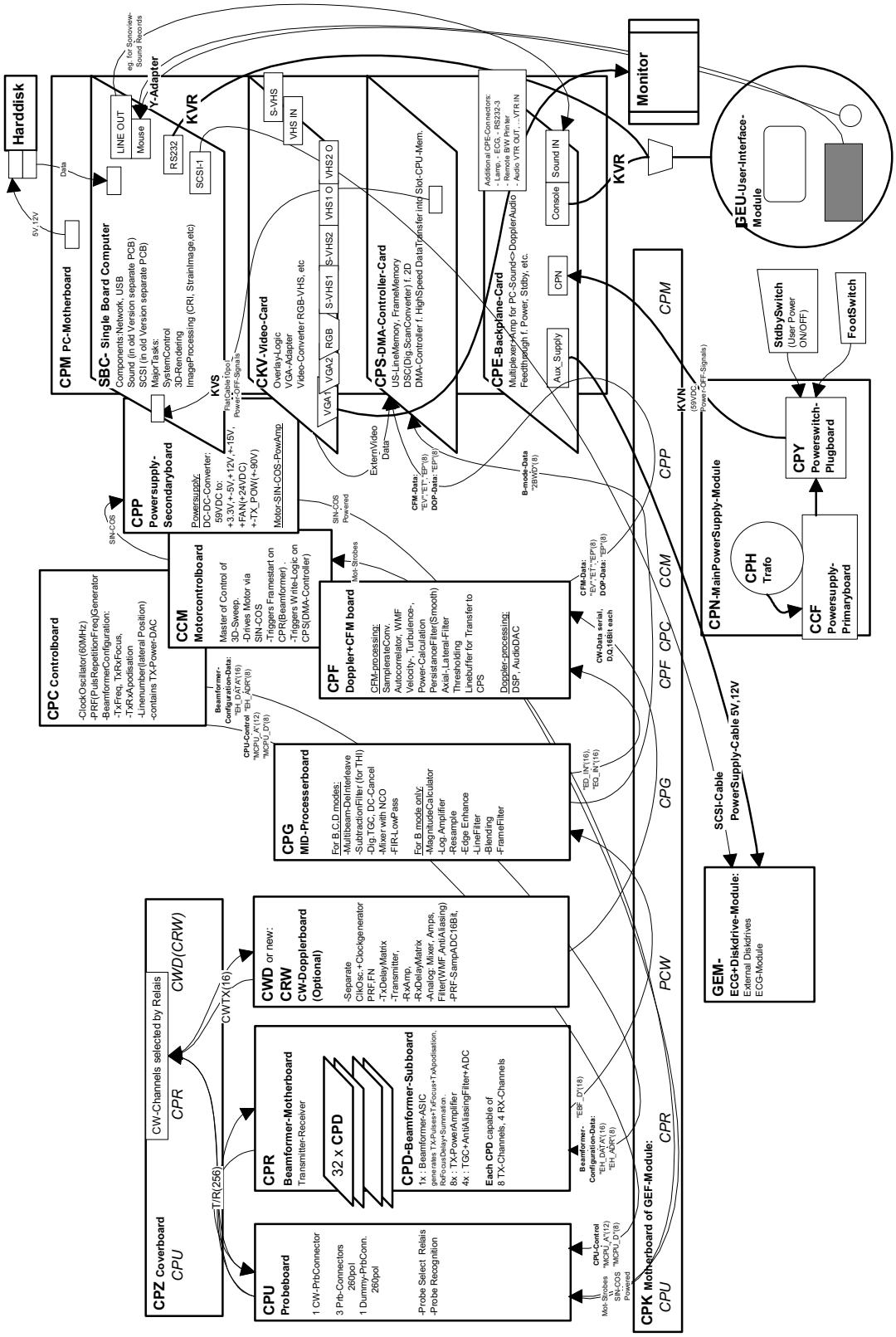


Figure 5-5 Voluson® 730 - Block Diagram

5-2-4 Dataflow Control Description

This section describes the functions of the Voluson® 730 Boards vs. different Operation Modes.

- CPC - System Control Board
- CPR - Beam former Board
- CPG - Mid-Processor Board
- CPF - Color Doppler Board
- CPS - Scan converter Board

  (CPS-Blockdiagram) see Figure 5-11 on page 5-25

- CKV - PC-Video converter Board

5-2-4-1 B-Mode

1.) CPC

The CPC contains the Clock-Oscillator (60MHz) and PRF-Generator.
It generates (drives) BF (=Beam former)-ASIC-Clock (60MHz) and shots for the CPR.
Instructs the BF-ASIC of TX-Frequ, TX-RX-Focus and Line number (lateral Position).
The CPC contains the TX-Power-DAC.

2.) CPR

Contains 32 CPD (BF-Subboards).
The CPD consists of BF-ASIC, TX-Amplifier, RX-TGC-Amplifier, Signal-ADC.
Each CPD can support 8 TX-Channels and 4 RX-Channels.

- TX-Channel: ASIC generates TX-Freq through dividing 60MHz by 2,3,4,5,... and TX-Focus.
- RX-Channel: ASIC generates Sample-Clocks for the ADC, manages RX-Focus (Delay and Chain-Adder) and Apodization.

3.) CPG

Contains Multibeam-DeInterleave, Subtraction Filter (for THI), Digital TGC, DC-Canceler, Mixer with NCO (Numeric Controlled Oscillator), FIR-LP (Low Pass Filter), Decimation, Magnitude Calculator, Log.Amp, Re-Sample, Edge Enhance, Line Filter, Blending and Frame Filter.

The signal is Multibeam-deinterleaved (the incoming signal is TDMA-multiplexed shot1- shot2- shot3- shot4- shot1...). After DC-cancelling the sig is mixed with the NCO-generated RX-Frequency and brought to LF-Spectrum, where the FIR-LP cuts HF.
The Magnitude-Calculator arranges the Complex Demodulation, and the Log.Amp the Conversion from High-Dynamic Linear Signal to the Low-Dynamik(e.g.8Bit) Log-Signal.
Several Postprocessors (Line Filter, Frame Filter, ReSample, Edge Enhance) enable smooth image quality while keeping contrast high.

- ***Special B-Mode Techniques:***

  a.) FFC (Frequency and Focus Composite)

  2 or more TX-shots are placed to the same Tissue-location. The shots have different TX-focus. By means of Blending they are composed to one whole RX-Line.

b.) THI = **HAR** (Tissue Harmonic Imaging)

Generally with THI the RX-Frequency is doubled, so that the axial resolution is increased due to the higher RX-Frequency. Another step of THI is the pulse-inversion: 2 TX-shots are placed to the same Tissue-location, one with positive, one with negative polarity. The Subtraction of both shots (Subtraction Filter) brings to bear the nonlinear-echo-reflection-properties of the tissue (especially in usage of Contrast-medias), which is very useful with extremely difficult-to-scan patients.

c.) CRI (Contrast Resolution Imaging)

Does not need any special functions of CPG.
Image is composed of Single different-direction-steered images. PC-calculated.

d.) VCI (Volume Contrast Imaging)

Does not need any special functions of CPG.
Image is composed of single at close range placed images. PC-calculated.
(Only possible with 4D-Probes).

4.) CPF

Has no function in B-Mode.

5.) CPS

B-mode-Data from CPG are written into Line Memory (Cine Mode-Mem). The DSC (Dig.ScanConverter) reads out the Lines and writes them scan converted (A-mode-polar to B-mode-cartesian) into the Frame Memory. From there the non deflected Image can be read out and overlaid with the rest of the Monitor-Image. see: 6.) CKV
Cine Mode: Same, Cine Mode-Memory is the Line Memory.

6.) CKV

Is the Graphic Board of the PC. Special function for B-MODE: The above mentioned overlay-function is performed here.

5-2-4-2 M-Mode

1.) CPC

see: 5-2-4-1 B-Mode

2.) CPR

see: 5-2-4-1 B-Mode

3.) CPG

see: 5-2-4-1 B-Mode

4.) CPF

see: 5-2-4-1 B-Mode

5.) CPS

M-mode-Data from CPG are written into Line Memory (Cine Mode-Mem). The DSC (Dig.ScanConverter) reads out the Lines and writes them into the Frame Memory. From there the Lines can be read out and overlaid with the rest of the Monitor-Image. see: 6.) CKV
Cine Mode: Same, Cine Mode-Memory is the Line Memory.

6.) CKV

see: 5-2-4-1 B-Mode

5-2-4-3 D-Mode (Pulsed Wave- and Continuous Wave Doppler)

1.) CPC
see: 5-2-4-1 B-Mode

2.) CPR
see: 5-2-4-1 B-Mode

3.) CPG
After DC-cancelling the sig is mixed with the NCO-generated RX-Frequency and brought to LF-Spectrum, where the FIR-LP cuts HF. Output to CPF.

4.) CPF
Arranges the FFT. D-Mode Data use the same Bus to the CPS as CFM-Data.

5.) CPS
D-Mode Data from CPF are written... see 5-2-4-1 B-Mode.

6.) CKV
see: 5-2-4-1 B-Mode

5-2-4-4 CFM-Mode (Color Flow Mode)

1.) CPC
see: 5-2-4-1 B-Mode

2.) CPR
see: 5-2-4-1 B-Mode

3.) CPG
After DC-cancelling the sig is mixed with the NCO-generated RX-Frequency and brought to LF-Spectrum, where the FIR-LP cuts HF. Output to CPF.

4.) CPF
Arranges the CFM-Processing.
WMF (Wall Motion Filter), Autocorrelator, Post-processing.

5.) CPS
Data from CPG and CPF are written... see 5-2-4-1 B-Mode.

6.) CKV
see: 5-2-4-1 B-Mode

5-2-4-5 3D-Mode

1.) CPC

see: 5-2-4-1 B-Mode

2.) CPR

see: 5-2-4-1 B-Mode

3.) CPG

see: 5-2-4-1 B-Mode

4.) CPF

Arranges the CFM-Processing. WMF (Wall Motion Filter), Autocorrelator, Post-processing. (In case that 3D-Color is active, else CPF not used)

5.) CPS

Data from CPG and CPF go to both:

a.) to the LineMemory,...FrameMemory,...CKV (see: 5-2-4-1 B-Mode) and

b.) via DMA-Controller and PCI-Bus to the PC-Memory.

The way from the Line Memory to the CKV is the same as in B-Mode.
This is the only case that the Line Memory-Frame Memory-Path is active in context with 3D-Mode and Real Time 4D-Mode – just for displaying the actual scanned 3D-Acquisition Sweep-B-Frame. All other displayed B-Frames in 3D-, 4D- or SonoView-Mode are PC-generated and do not need CPS any more.

6.) CKV

see: 5-2-4-1 B-Mode

5-2-4-6 Real Time 4D-Mode

1.) CPC

see: 5-2-4-1 B-Mode

2.) CPR

see: 5-2-4-1 B-Mode

3.) CPG

see: 5-2-4-1 B-Mode

4.) CPF

Arranges the CFM-Processing. WMF (Wall Motion Filter), Autocorrelator, Post-processing. (In case that 4D-Color is active, else CPF not used)

5.) CPS

In Real Time 4D the signal path is even simpler than in 3D, because we do not have to display the actual scanned 3D-Acquisition Sweep-B-Frame. Data from CPG and CPF go via DMA-Controller and PCI-Bus to the PC-Memory.
All displayed B-Frames are PC-generated and do not need CPS any more.

6.) CKV

see: 5-2-4-1 B-Mode

5-2-4-7 External Video Mode (Video display from VCR)

1.) CPC

Not used for Signal-Processing

2.) CPR

Not used for Signal-Processing

3.) CPG

Not used for Signal-Processing

4.) CPF

Not used for Signal-Processing

5.) CPS

V-Rec-Data from the CKV-Video-Decoder are input to the CPS via the CFM-Data-Bus (CPF must disable Output-Driver). In the LM-FPGA the data are synchronized and output to the FM-FPGA. In the Extern-Video Mode the FM-FPGA is specially configured, that's why the right part of the CPS-Blockdiagram is not valid in this Mode. In this Mode the FM-FPGA re-scales the Videorecorder-Image, that is to say that the Video is made for fitting exact into the Monitor-Frame.

6.) CKV

AD-Conversion of the grapped Video, etc.

5-2-5 Description of Software Options

To activate the software options: touch UTILITIES, SYSTEM SETUP and select the OPTION page.
For further details see: Basic User Manual Voluson® 730, chapter 17.3.4

Table 5-2 Software Options

	SW-Options	PSU	Description
1	Real Time 4D	11	5-2-5-1 Real Time 4D
2	DICOM	4	5-2-5-2 DICOM
3	RT_4D_Biopsy	13	5-2-5-3 Real Time 4D-Biopsy
4	VOCAL	3	5-2-5-4 VOCAL - Virtual Organ Computer-aided Analysis
5	Harmonic Imaging	10	5-2-5-5 Tissue Harmonic Imaging (THI)
6	SonoView	9	5-2-5-6 Sonoview – Image Management
7	CRI	15	5-2-5-7 CRI - Compound Resolution Imaging
8	Tissue Doppler	16	5-2-5-8 Tissue Doppler Imaging
9	VCI	14	5-2-5-9 VCI - Volume Contrast Imaging

5-2-5-1 Real Time 4D

Real Time 4D mode is obtained through continuous volume acquisition and parallel calculation of 3D rendered images. In Real Time 4D mode the volume acquisition box is at the same time the render box. All information in the volume box is used for the render process. In Real Time 4D mode a “frame rate” of up 16 volumes/second is possible. By freezing the acquired volumes, size can be adjusted, manipulated manually as known from the Voluson 3D Mode.

5-2-5-2 DICOM

V730 software package providing following DICOM functionality:

- Storage Service Class
- Print Management Service Class
- Modality Worklist Management Service Class

Sending of reports - All OB/Gyn measurements can be sent to a PC. Receiving of these reports is supported by ViewPoint workstation “PIA” only. All other workstations can be adapted individually.

5-2-5-3 Real Time 4D-Biopsy

For minimal invasive procedures like biopsies, ultrasound is a widely used method to visualize and guide the needle during puncture. The advantage in comparison with other imaging methods is the real-time display, quick availability and easy access to any desired region of the patient. The 4D biopsy allows for real time control of the biopsy needle in 3D multi-planar display during the puncture. The user is able to see the region of interest in three perpendicular planes (longitudinal, transversal and frontal section) and can guide the biopsy needle accurately into the centre of the lesion.

5-2-5-4 VOCAL - Virtual Organ Computer-aided Analysis

Diagnosis and therapy of cancer is one of the most important issues in medical care.The new VOCAL™- Imaging program is an extension of the 3DView™ software, integrated in Kretztechnik’s VOLUSON® sonography systems and also available for PC. It allows completely new possibilities in cancer diagnosis, therapy planning and follow-up therapy control.

VOCAL™ offers different functions:

Volume Calculation - Manual tracing of contours in three dimensions

3D Color Histogram - Automatic calculation of the vascularization

Shell Imaging - construction of a virtual shell which covers the entire contour to separately calculate internal tumor vascularization and peripheral vascularization for tumor therapy planning and follow up control.

5-2-5-5 Tissue Harmonic Imaging (THI)

In Tissue Harmonic Imaging, acoustic aberrations due to tissue are minimized by receiving and processing the second harmonic signal that is generated within the insonified tissue. Voluson`s high performance THI provides superb detail resolution and penetration, outstanding contrast resolution, excellent acoustic clutter rejection and an easy to operate user interface for switching into THI mode.

5-2-5-6 Sonoview – Image Management

Sonoview, optional software for digital image management on ultrasound system, stores and transfers ultrasound images and Kretz volume files (V730). Sonoview allows users to store, view, report, and transfer images and volumes stored on the Voluson® 730. In addition, Sonoview allows users to send and print images via DICOM network also.

Sonoview enables storage and retrieval of 2D Images and Cine Loops as well as 3D/RT4D volumes and Live3D and RT4D sequences on HD-Drive, MO-Drive and CD-Drive.

5-2-5-7 CRI - Compound Resolution Imaging

In this special B-mode, beams are transmitted not only perpendicularly to the acoustic window, but also in oblique directions. Between three and nine beams are correlated to form one image line.
The advantages of Compound Resolution Imaging are enhanced contrast resolution with better tissue differentiation and clear organ borders. Also vessel walls and tissue layers are emphasized for easier recognition.

5-2-5-8 Tissue Doppler Imaging

The Tissue Color Doppler Imaging is used for color encoded evaluation of heart movements.
The TD image provides information about tissue motion direction and velocity.

5-2-5-9 VCI - Volume Contrast Imaging

Volume Contrast Imaging utilizes 4D transducers to automatically scan multiple adjacent slices and delivers a real-time display of the ROI.
This image results from a special rendering mode consisting of texture and transparency information.
VCI improves the contrast resolution and therefore facilitates finding of diffuse lesions in organs.
VCI has more information (from multiple slices) and is of advantage in gaining contrast due to improved signal/noise ratio.

5-2-6 Description of Hardware Options

Table 5-3 Hardware Options

	HW-Options	Description
1	CW-Doppler	5-2-6-1 CW - Continuous Wave Doppler
2	ECG Digital Module	5-2-6-2 ECG Digital Module
3	Scan freeze Footswitch	5-2-6-3 Scan freeze Footswitch

5-2-6-1 CW - Continuous Wave Doppler

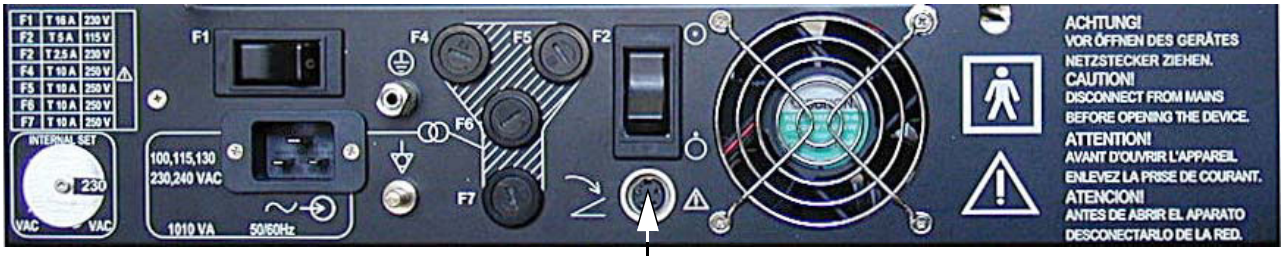
CW Doppler mode provides real time spectral analysis of CW Doppler signals. This information describes the Doppler shifted signal from the moving reflectors in the CW Doppler beam. CW Doppler can be referenced through a small pencil probe or phased array scan head, but it can also be used in conjunction with a 2D image which has an M-line superimposed on the 2D image indicating the position of the Doppler sample volume. For through-the-beamformer CW, this beam is steerable by the operator, and is done by adjusting the location of the M-line. The CW Doppler beam, or M-mode line, can be steered allowing interrogation along an operator-selected line within the image.
This option can be upgraded by implementing the CW-Dopplerboard (CRW, old version CWD).

5-2-6-2 ECG Digital Module

The ECG-preamplifier is used for acquiring an ECG-signal to be displayed with the ultrasound image. This optional peripheral serves for gaining an ECG-signal to mark the systolic and end diastolic moments in M-Mode and Doppler evaluations.
The ECG-preamplifier must not be used for ECG-diagnostics. It is not intended for use as a cardiac monitor and must not be used for an intra-operative application on the heart.

1.) MAN3 (external version)
2.) MAN6 (internal, digital version)

5-2-6-3 Scan freeze Footswitch



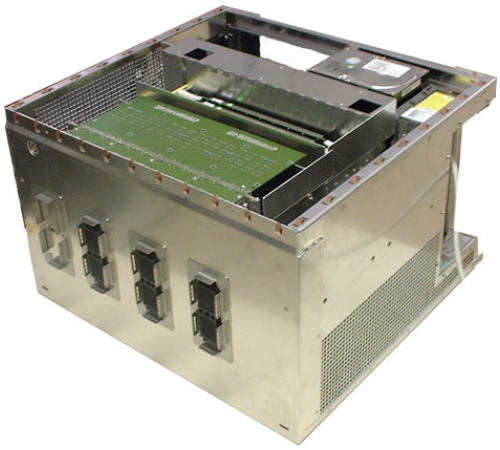
Footswitch connected to Power Supply-Box (below Main Electronic-Box)

Figure 5-6 Foot-switch Connector on CPN

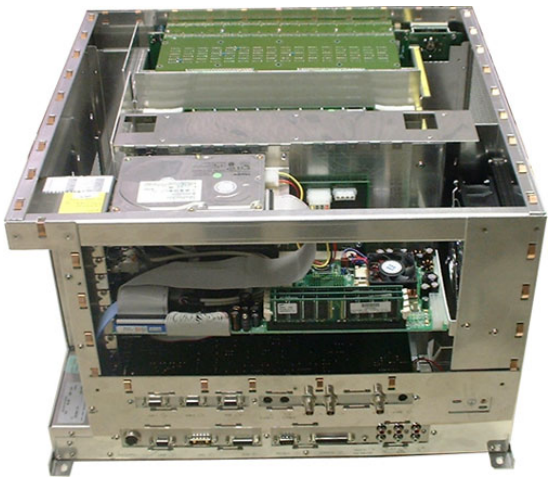
Section 5-3
Main board Chassis GEF Module

The GEF Module contains the Front End processor and the Back End processor and the Secondary Power supply for the full GEF Chassis.
Additionally GEF Module is the connection point of the internal I/O wiring.

Front



Rear with Internal I/O (Audio Video)



View from Right with Internal I/O (PC-part)

Top View

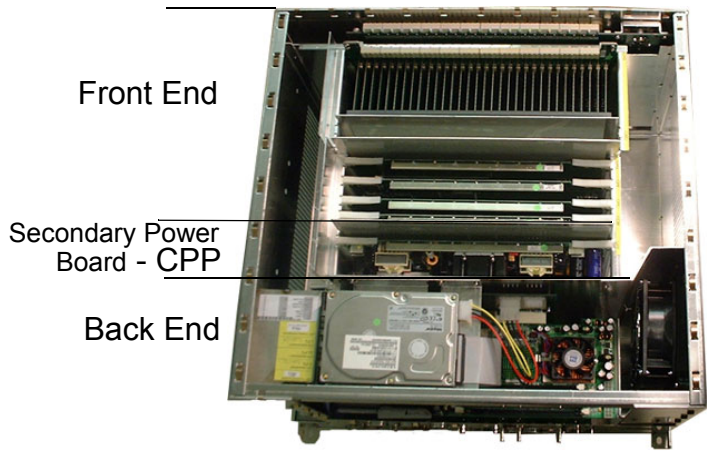


Figure 5-7 Mechanic of GEF Module

Section 5-4
Front End Processor

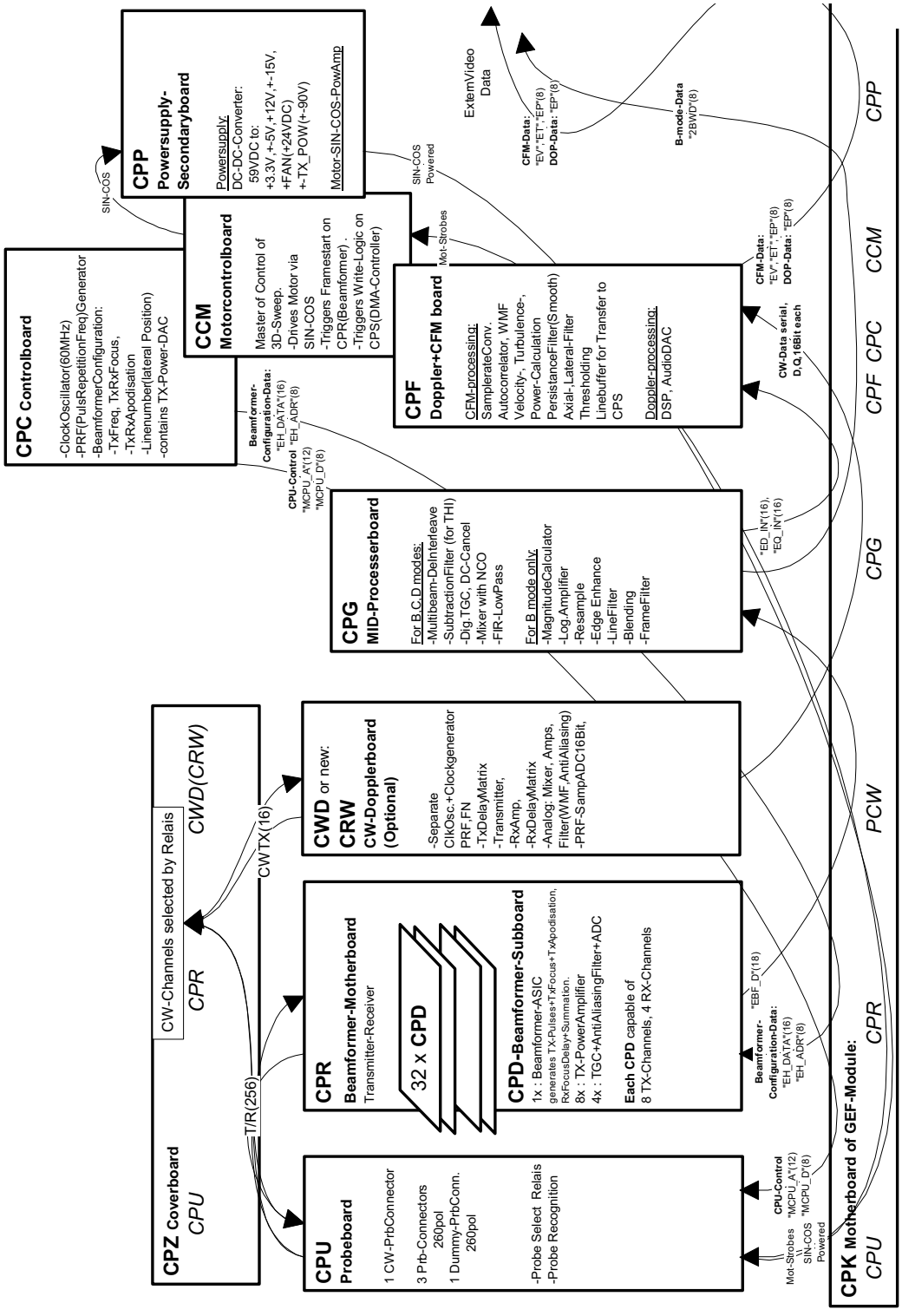


Figure 5-8 Front End Processor - Block Diagram

Section 5-4 Front End Processor (cont'd)

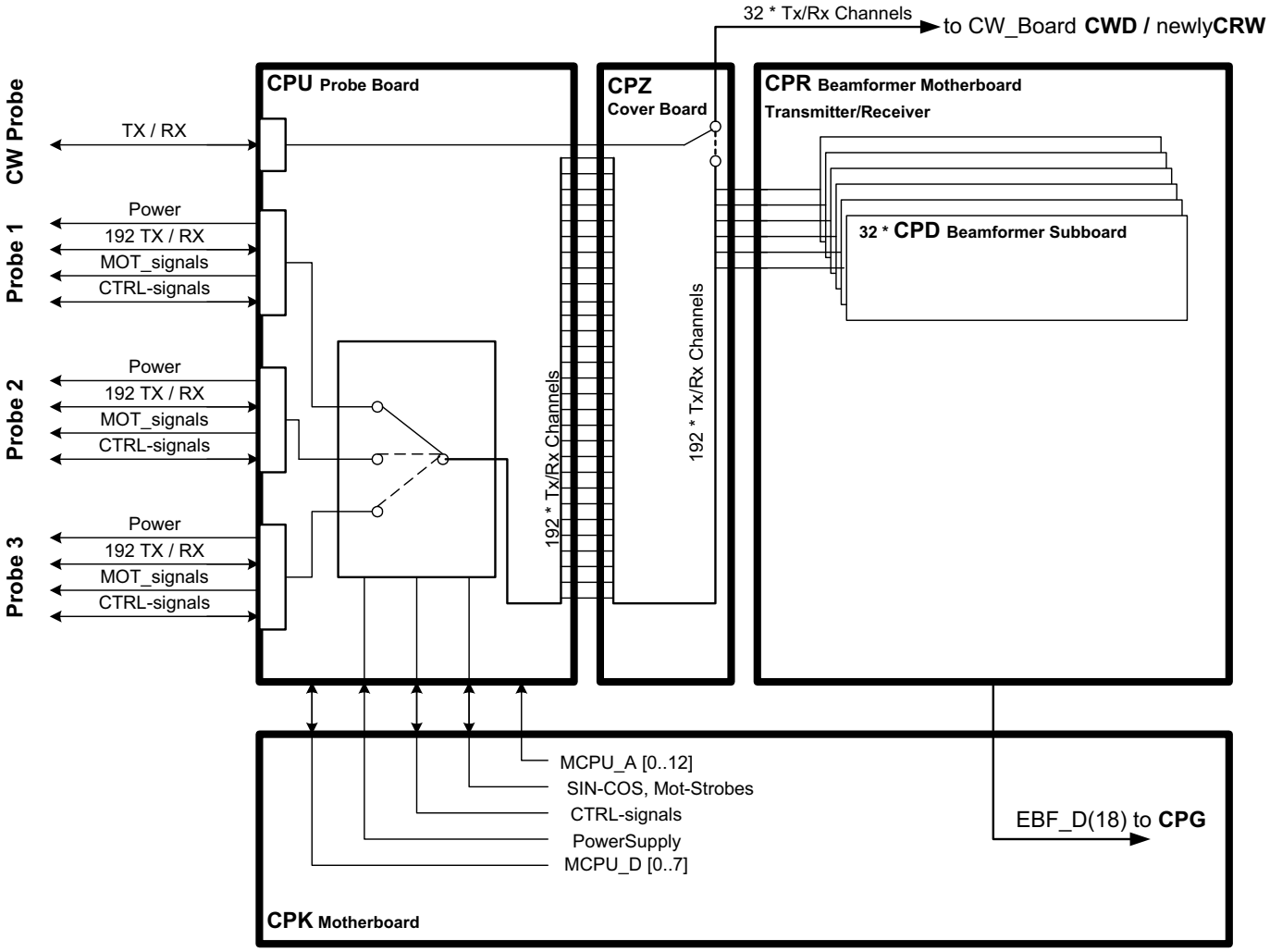


Figure 5-9 CPU + Beamformer

5-4-1 Front End - Board Descriptions

5-4-1-1 CPU - Probe Board

- 1 CW-Probe Connector
- 3 Probe-Connectors 260pin
- 1 Dummy-Probe Connector 260pin
- Probe Select Relays
- Probe Recognition

5-4-1-2 CPR - Beamformer Board

Transmitter-Receiver (192 transmitter channel used, 128 Receiver channels)

CPR contains 32 pieces of CPD

5-4-1-2-1 CPD-Beamformer-Sub-board

1x : Beamformer-ASIC
generates TX-Pulses + TX-Focus +TX-Apodisation, Rx Focus Delay and Summation

8x : TX-Power Amplifier

4x : TGC + Anti Aliasing Filter + Analogue Digital Conversion (ADC)

Each CPD is capable of 8 TX-Channels and 4 RX-Channels

5-4-1-3 CRW - (old version: CWD) CW-Doppler Board (Optional)

- Separate Clock Oscillator + Clock generator PRF, FN
- TxDelayMatrix
- Transmitter,
- Receiver Amplifiers (RxAmp),
- Receiver Delay matrix (RxDelayMatrix)
- Analogue: Mixer, Amplifier, Filter(WMF, Anti Aliasing)
- PRF-SampADC16Bit,

5-4-1-4 CPZ - Cover Board

Transfers the analogue transmitting / receiving signals between the following boards:

- CPU (in old version BYM)
- CPR
- CRW (in old version CWD)

192 Transmitter channels, 128 Receiver channels, 16 CW-Doppler channels - switched by relays at CPZ

5-4-1 Front End - Board Descriptions (cont'd)

5-4-1-5 CPG - MID-Processor Board

A.) For B,C,D modes:
- Multi Beam-DeInterleave
- Subtraction Filter (for THI)
- Digital TGC, DC-Cancelling
- Mixer with NCO
- FIR-Low Pass

B.) For B mode only:
- Magnitude Calculator
- Logarithmic Amplifier
- Resample
- Edge Enhance
- Line Filter
- Blending
- Frame Filter

5-4-1-6 CPC - Control Board

- Clock Oscillator (60MHz)
- PRF (Pulse Repetition Frequency) Generator
- Beamformer Configuration:
- Tx (transmitting Frequency, TxRx (transmitting/receiving) Focus timing
- TxRx (transmitting/receiving) Apodisation
- Line number (lateral Position)
- contains TX-Power-DAC

5-4-1-7 CPF - Doppler+CFM Board

A.) CFM-processing:
- Sample rate Conversion
- Auto-Correlator
- Wall motion filter (WMF)
- Velocity-, Turbulence-, Power-Calculation
- Persistence Filter (Smooth)
- Axial-, Lateral-Filter
- Thresholding
- Line buffer for Transfer to CPS

B.) Doppler-Processing:
- DSP, Audio DAC

C.) Beamformer- Configuration-Data:
- "EH_DATA"(16)
- "EH_ADR"(8)
- B-Mode-Data

5-4-1 Front End - Board Descriptions (cont'd)

5-4-1-8 CCM - Motor Control Board

- Master of Control of 3D-Sweep
- Drives Motor via SIN-COS
- Triggers Frame-start on CPR (Beamformer)
- Triggers Write-Logic on CPS (DMA-Controller)

5-4-1-9 CPP- Power Supply Secondary Board + Motor Power stage

used for Supply of both Front End and Back End DC-DC-Converter:

59VDC to following output voltages:

+ 3.3V, +/-5V, +12V, +/-15V,

+ FAN (+24V DC)

+TX_POW (+/-90V) fused by F7

-TX_POW (+/-90V) fused by F1

Motor Sinus2 Powerstage Amplifier fused by F3

Monitor Cosinus2 Powerstage Amplifier fused by F6

5-4-1-10 CPK - Motherboard of GEF-Module

Following boards are direct connected to the CPK:

- CPU (BYM) - Probe connector Board
- CPR - Beam former Board
- CRW (CWD) - CW-Doppler Board
- CPG - Mid-Processor Board
- CPF - Doppler + CFM Board Board
- CPC - System Control Board
- CCM - Motor Control Board
- CPP - Power Supply Board
- CPM - Motherboard (electrical Signal- and Supply connection between all PC-Plug-In Boards)

Section 5-5
Back End Processor

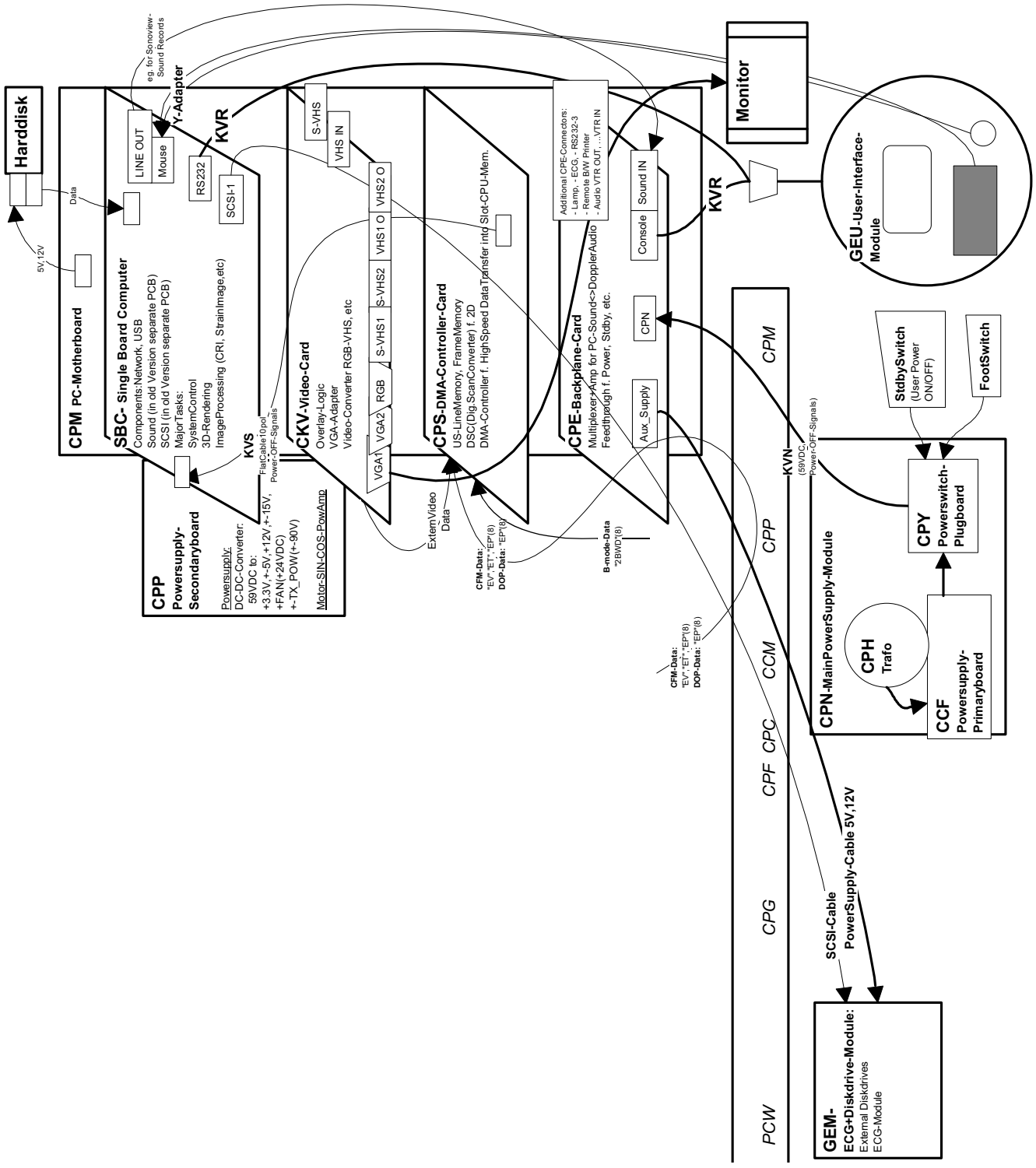


Figure 5-10 Back End Processor - Block Diagram

5-5-1 Blockdiagram CPS

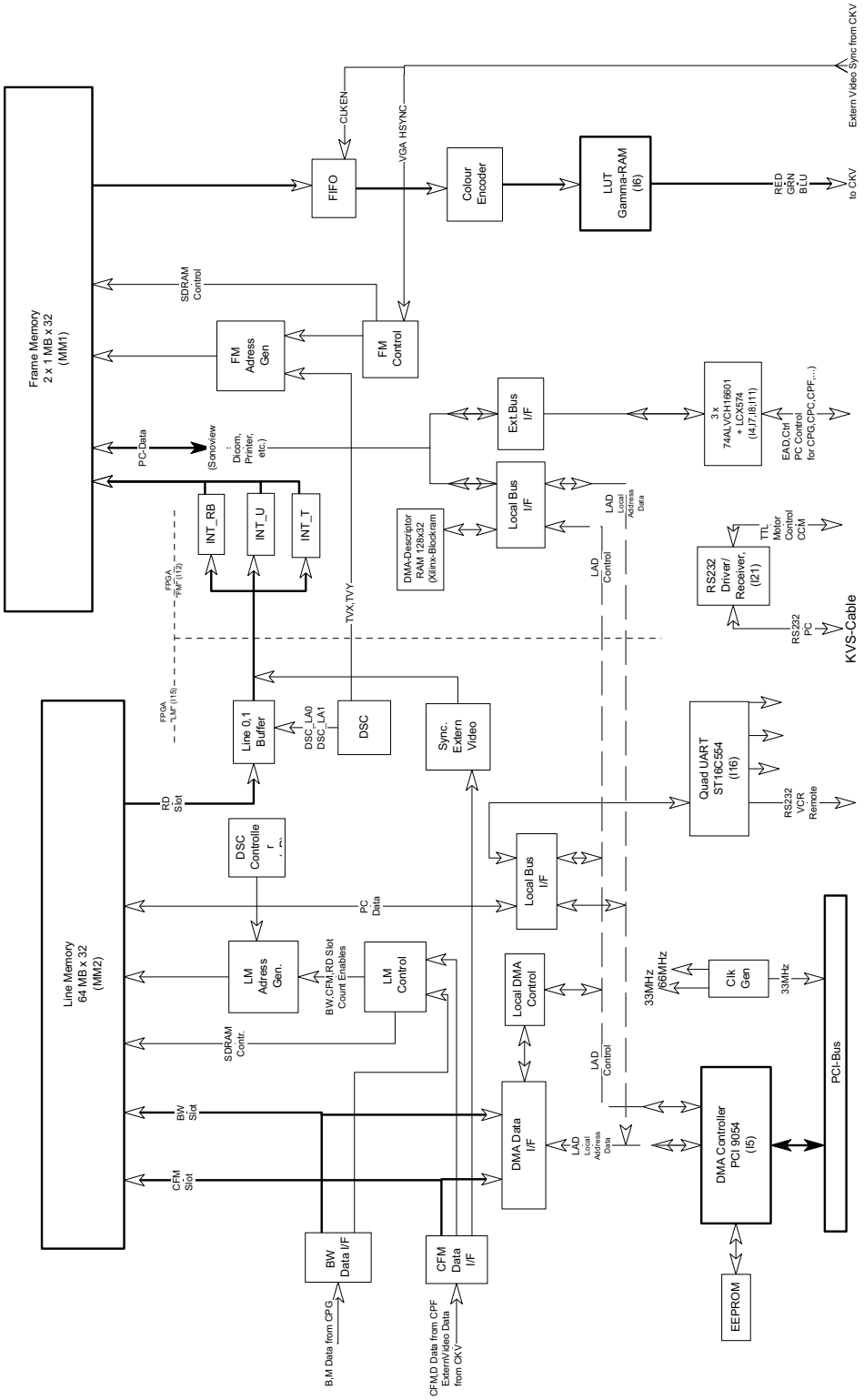


Figure 5-11 Blockdiagram CPS

5-5-2 Back End - Board Descriptions

5-5-2-1 SBC - Single Board Computer

Built in or external Components:

- Network, USB
- Sound (in old Version separate PCB)
- SCSI (in old Version separate PCB)

Major Tasks:

- System Control
- 3D-Rendering
- Image Processing (CRI, Strain Image, etc.)
- Mouse (COM-Interface)
- RS232 (User Interface)
- PS2 (User Interface PC-Keyboard, Mouse as Trackball)

5-5-2-2 CPS - DMA-Controller-Card

- US-Line Memory, Frame Memory
- DSC(Digital. Scan Converter) for 2D
- DMA-Controller f. High Speed Data Transfer into Slot-CPU-Memory

5-5-2-3 CKV - Video-Card

- Overlay-Logic (Adding the Overlay graphics to the Ultrasound graphics)
- VGA-Output (2 Channels) for the System Main Monitor
- Video-Converter RGB-VHS, External Video Playback PAL/NTSC Video Generation etc.

5-5-2-4 Hard Disk Drive

Minimum 20GB; IDE

Stores the system programs and Image filing (patient data, Report files)

5-5-2-5 CPE - Back Panel I/O-Card

Multiplexer +Amplifier for PC-Sound<>Doppler Audio

Feed through for DC- Power and signals and for built in Peripherals (User Interface, Disk drive module, ECG, etc.)

5-5-2-6 CPM - PC-Motherboard card

Industrial Standard compatible (PCI) Motherboard

For interfacing between Front End and Back End Processor.

CPE is connected at CPM too.

5-5-2 Back End - Board Descriptions (cont'd)

5-5-2-7 CPP- Power Supply Secondary Board + Motor Power stage

used for Supply of both Front End and Back End DC-DC-Converter:

59VDC to following output voltages:

+ 3.3V, +/-5V, +12V, +/-15V,

+ FAN (+24V DC)

+TX_POW (+/-90V) fused by F7

-TX_POW (+/-90V) fused by F1

Motor Sinus2 Powerstage Amplifier fused by F3

Monitor Cosinus2 Powerstage Amplifier fused by F6

Section 5-6
Internal I/O

Because of different Slot CPU Card versions there are three different internal wirings

1.) SNO's A05500 - A05724 (850MHZ PC, no Sound card, separate SCSI-Card installed) *Figure 5-12: Internal I/O Board 1*

2.) SNO's A05725 - A06268 (850MHZ PC, separate Sound card, separate SCSI-Card installed) *Figure 5-13: Internal I/O Board 2*

3.) SNO's A06269 - A----- (1GHZ PC, Sound onboard, SCSI onboard) *Figure 5-14: Internal I/O Board 3*

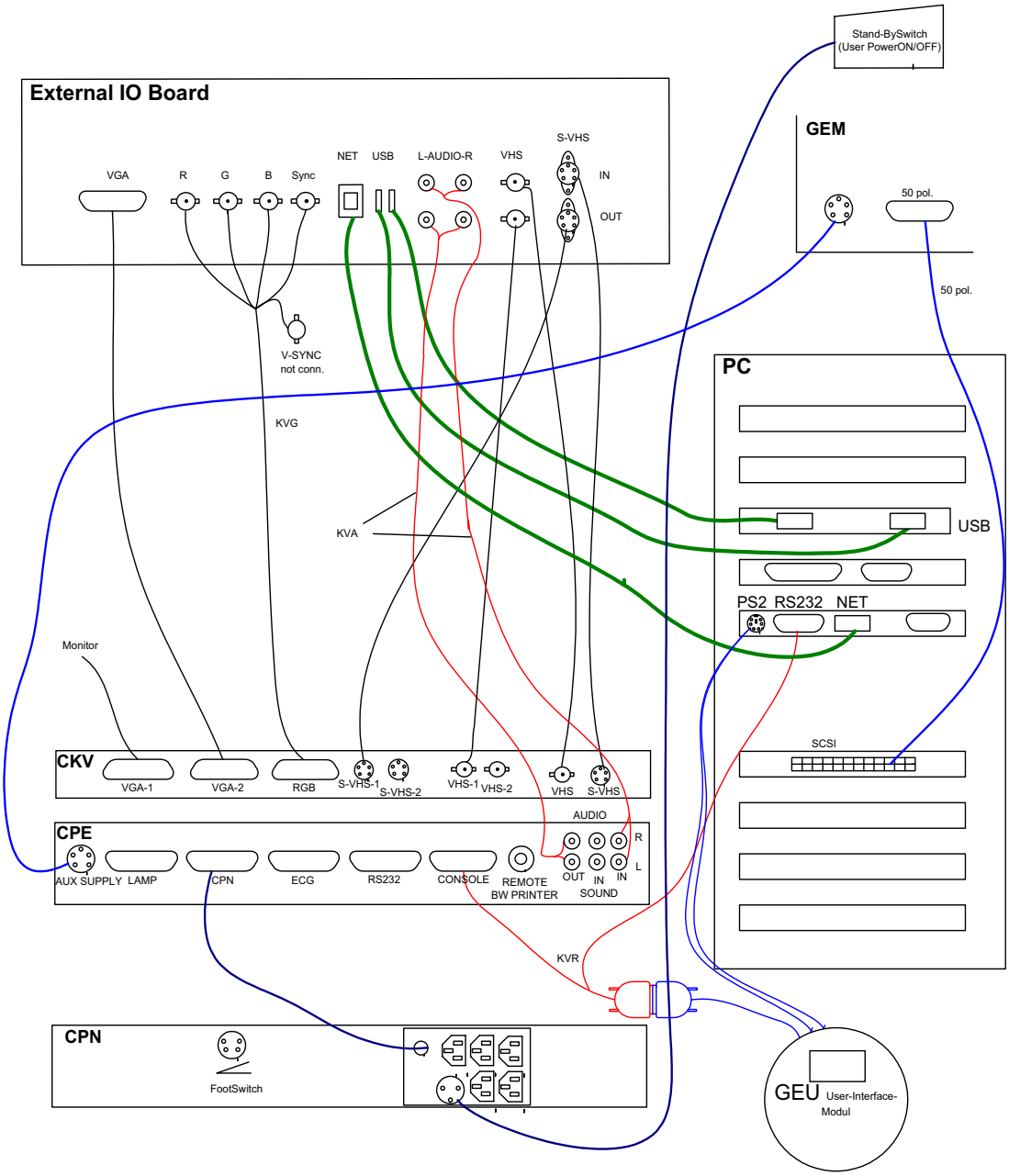


Figure 5-12 Internal I/O Board 1

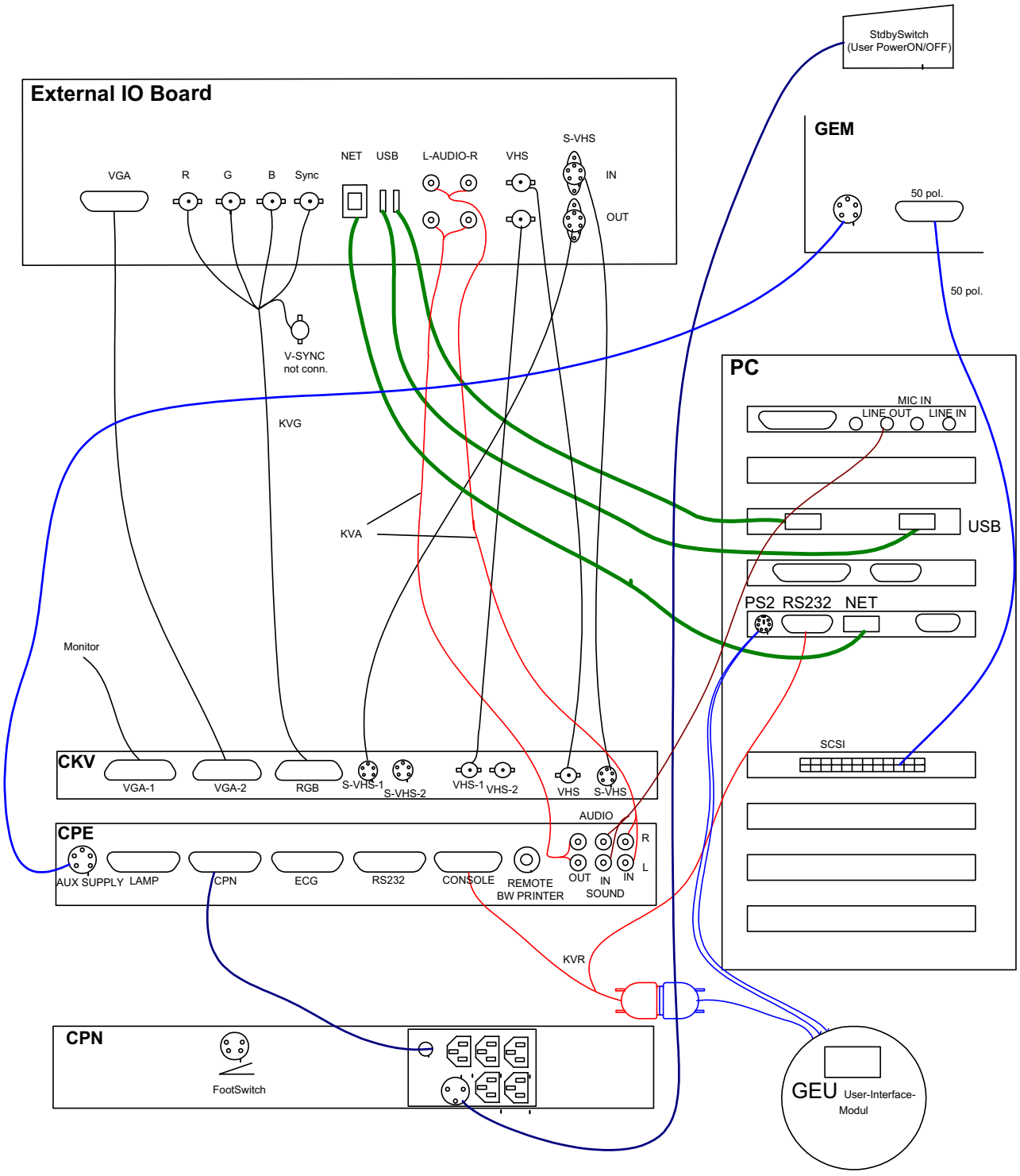


Figure 5-13 Internal I/O Board 2

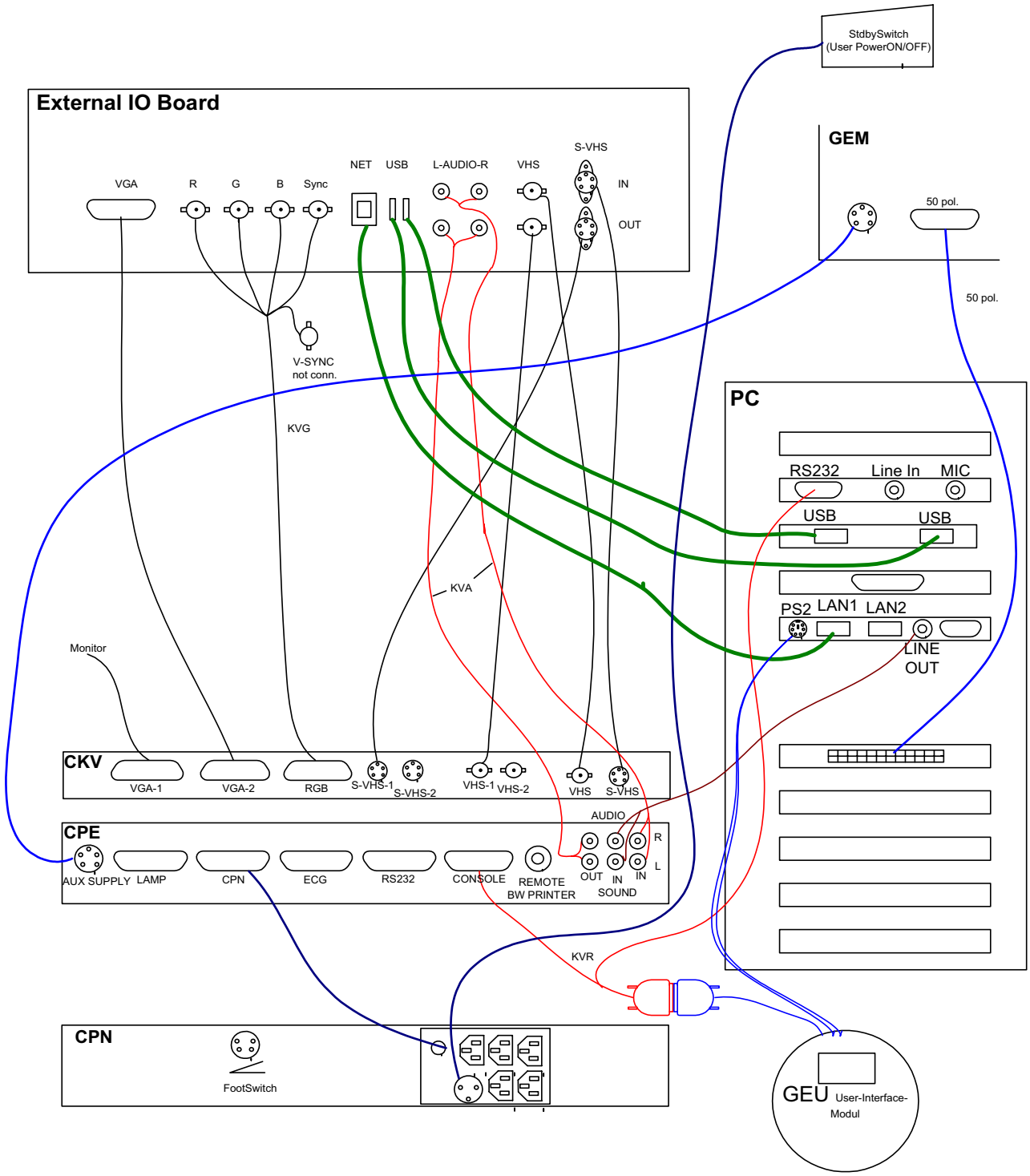


Figure 5-14 Internal I/O Board 3

Section 5-7
Top Console

The Voluson® 730 Operator Control Panel (OCP) consists of the following electronic subassemblies and/or functional components:

- Display/Touch screen module:
  - Electro luminescence VGA display – 640x480 pixels
  - Resistive 5-wire analog touch screen
  - Integrated display graphics controller
  - Embedded PC104 486 PC based controller card
- Console module:
  - Embedded 80C32 console micro controller
  - Built-in serial UART for PC104 communication
  - Slide pots TGC with zero raster position)
  - Rotary Encoders with integrated push buttons
  - PS/2 compatible Trackball (2”) with standard PC interface
  - PS/2 compatible Qwerty Keyboard with standard PC interface
  - LED indicators with 3 intensity levels (off, 50%,100%)
  - 2 Speaker, used for Doppler and voice replay
- DC/DC Converter:
  - Converts 12V DC input voltage to 5V DC output voltage for supplying UI components

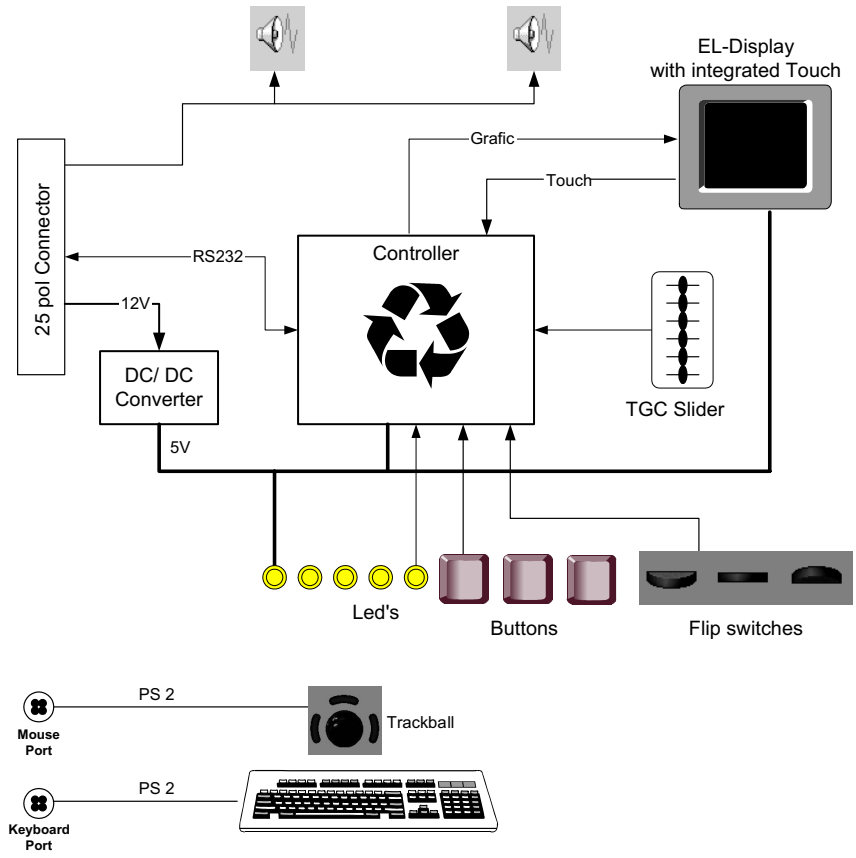


Figure 5-15 Top Console

Section 5-8
Monitor

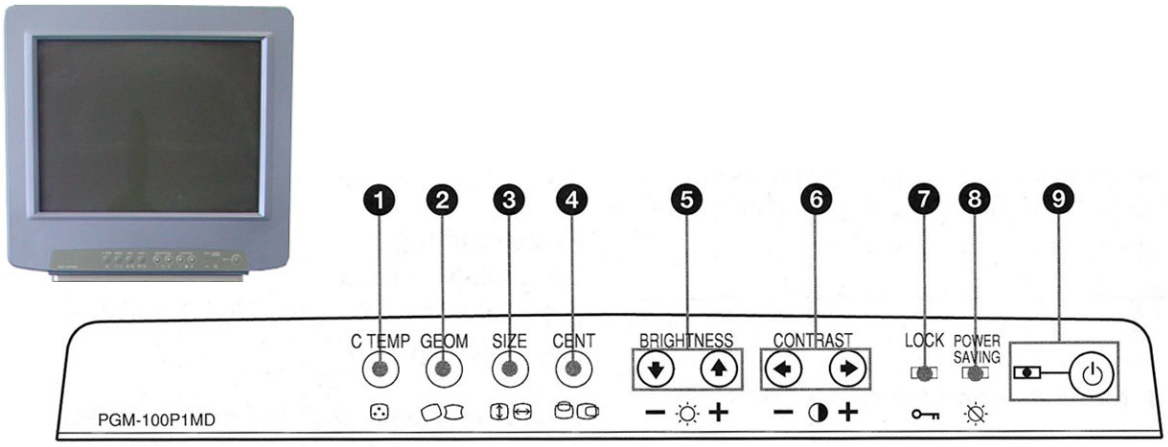


Figure 5-16 Monitor Adjustment buttons

For further details refer to: Section 6-3 "Monitor Adjustment" on page 6-2.

Section 5-9
External I/O

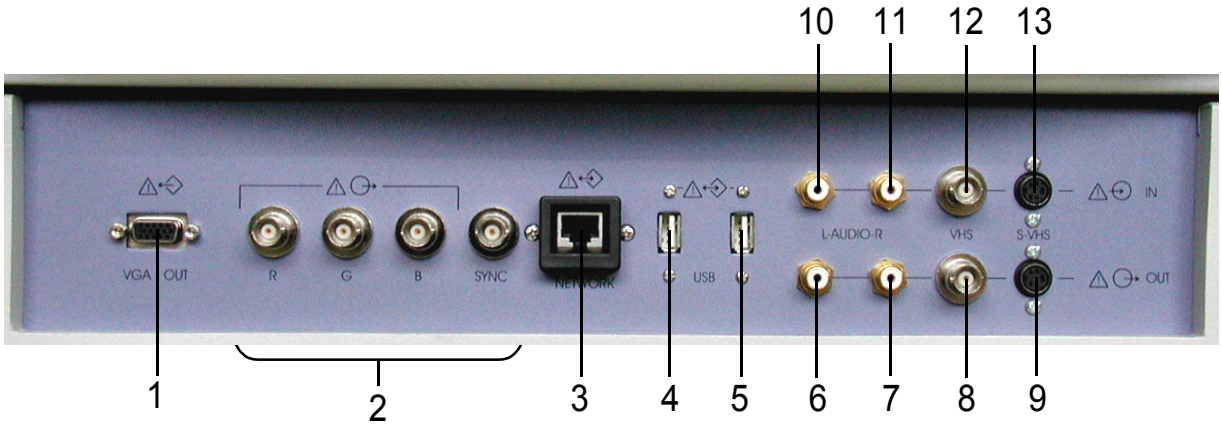


Figure 5-17 External I/O Panel Connectors

⚠ **NOTICE** If peripherals (e.g. VCR) are connected at the Internal I/O, some connectors on the External I/O may not be available. Please refer to Section 5-6 "Internal I/O" on page 5-28.

Table 5-4 External I/O Connector Description

Item	Connector Name	Description
1	VGA (OUTPUT)	print out VGA signal with monitor/printer
2	R, G, B, H/V SYNC	outputs for color video printer/monitor
3	NETWORK	DICOM input/output twisted pair RJ-45 10/100 megabit/s
4	USB-1	USB port
5	USB-2	USB port
6	AUDIO LEFT OUT	
7	AUDIO RIGHT OUT	
8	VHS OUT	
9	S-VHS OUT	
10	AUDIO LEFT IN	
11	AUDIO RIGHT IN	
12	VHS IN	
13	S-VHS IN	

Section 5-10
Peripherals

5-10-1 General Information:

The GEM Module contains the Magneto Optical Drive and the CD-RW Drive.
Additionally the ECG-preamplifier MAN6 can be installed as an Option.

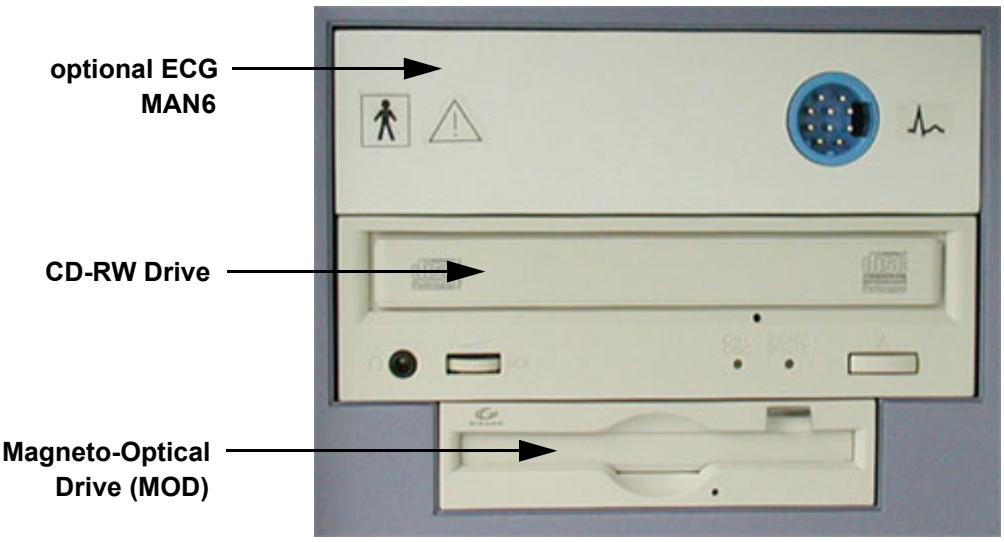


Figure 5-18 GEM incl. optional ECG

5-10-1-1 ECG-preamplifier (MAN6 - optional)

The ECG-preamplifier is used for acquiring an ECG-signal to be displayed with the ultrasound image. This optional peripheral serves for gaining an ECG-signal to mark the systolic and end diastolic moments in M-Mode and Doppler evaluations.

The ECG-preamplifier must not be used for ECG-diagnostics. It is not intended for use as a cardiac monitor and must not be used for an intra-operative application on the heart.

5-10-1-2 CD-RW Drive

Internal SCSI - 24x Read / 8x Write / 8x Re-Write CD-RW Drive
Access Speed: 140ms; Max Data Transfer (Read): 3600KB/sec; Buffer size: 4MB

Recordable and Re-writable CD´s are ideal for any storage purpose and offer complete security and reliability for important data.

5-10-1-3 Magneto-Optical Drive

Storage capacity by disk: 1.3GB, 640MB, 540MB, 230MB, 128MB

The MO-Drive allows to read and write any GIGAMO standard 1.3GB disk at twice the liner bit density. Additionally it retains full read/write compatibility with ISO/IEC 3.5 - inch disks ranging from original 128MB to current 640MB.

MO disks are nearly indestructible and immune from the problems that plague magnetic media. MO disks can be rewritten an unlimited number of times.

Section 5-11
Power Distribution

5-11-1 CPN-Module (Primary Power Module)

5-11-1-1 Mechanical Concept and Overview

The AC Power's main tasks are to supply the various internal subsystems with AC power and to galvanically isolate the scanner from the on site Mains Power System. To reduce inrush current, an inrush current limiter as well as an EMI filter. Voltage to peripherals can be configured to either 115 VAC or 230 VAC.

The mains cord has plugs in both ends. A female plug connects to the scanner and a male plug to the mains outlet on site.

The mains voltage is routed via an EMI filter to the Mains Switch, located on the rear of the system.

The Mains Switch is of the auto fuse type, if for some reason the current grows to high, the switch will automatically break the power.

From the Mains Switch, the AC power is routed via an Inrush Current Limiter to a internal outlet connector for the Mains Transformer.

5-11-1-2 Major Functions of CPN

- Inrush Current limiter
- Power factor correction transformer for Sinus load for the mains voltage
- Power down Circuitry + Standby-Switch
- The CPN module generates 57VDC (+/-2V) as an input voltage for the Secondary Power supply of the GEF module.
- The CPN module contains also the isolation transformer for the peripherals. (Maximum load: 350 VA; see: Basic User Manual Chapter 22 Technical Data/Information)

NOTE: All DC-supply voltages for built in peripherals are generated in GEF-module not inside CPN.

NOTE: The system mains supply input voltage can be set to: 100V,115V,130V,230V,240V. The output voltages may be set to 110V or 230VAC (independent from the input voltages)

5-11-1-3 Fuses on Rear Panel

F1: The main Input voltage is fused by a magnetic Circuit breaker (Rated current 16A) built in the Main Power switch labelled F1

F2:The AC Output voltage (110/230V) is fused by F2 (magnetic Circuit breaker 2.5/5A)

F3, F4, F5, F6: are the fuses for the input voltage for the switching power supplies generating the DC-Supply voltage for the Secondary power supply inside GEF-Module

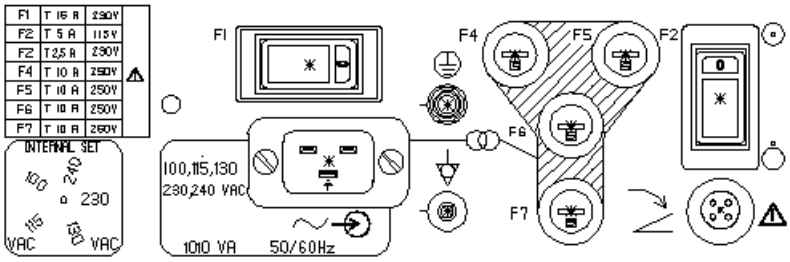


Figure 5-19 Fuses

5-11-1-4 Fuses inside CPN

F1 on CCF board: fuses the surge current limiter circuit.

NOTE: If this fuse is blown, the NTC (limiting the surge current will remain hot during system operation and if the system is switched off/on within a few seconds the surge current could be to high. Because of this reason Fuse F1 on CPN Rear Panel or the Hospital circuit fuse could be blown.

Section 5-12
Mechanical Descriptions

5-12-1 Physical Dimensions

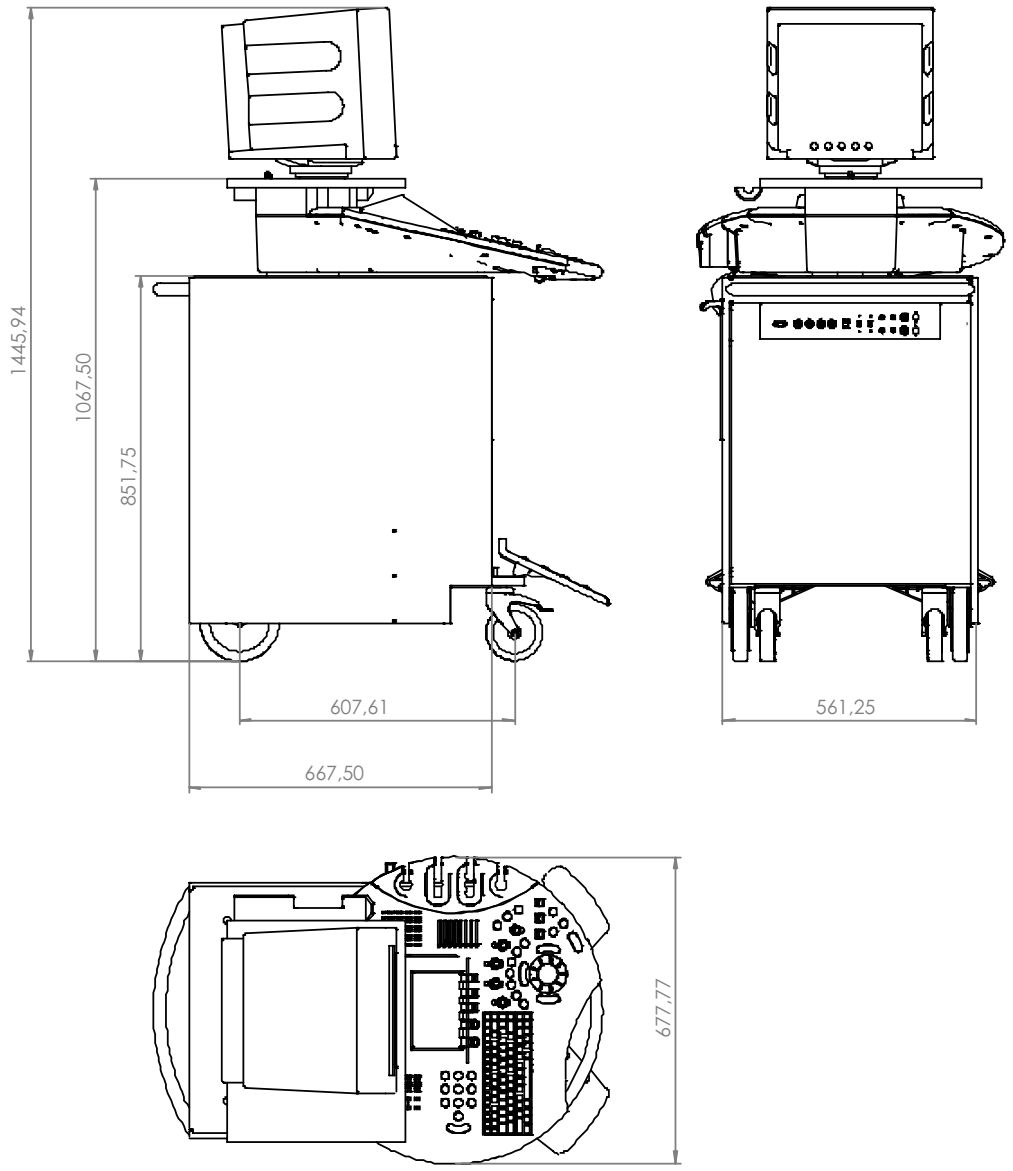


Figure 5-20 Physical Dimensions

5-12-2 Monitor

- Tilt: 10° forwards and backwards
- Swivel: +/-45°rotation.

5-12-3 Top Console Positioning

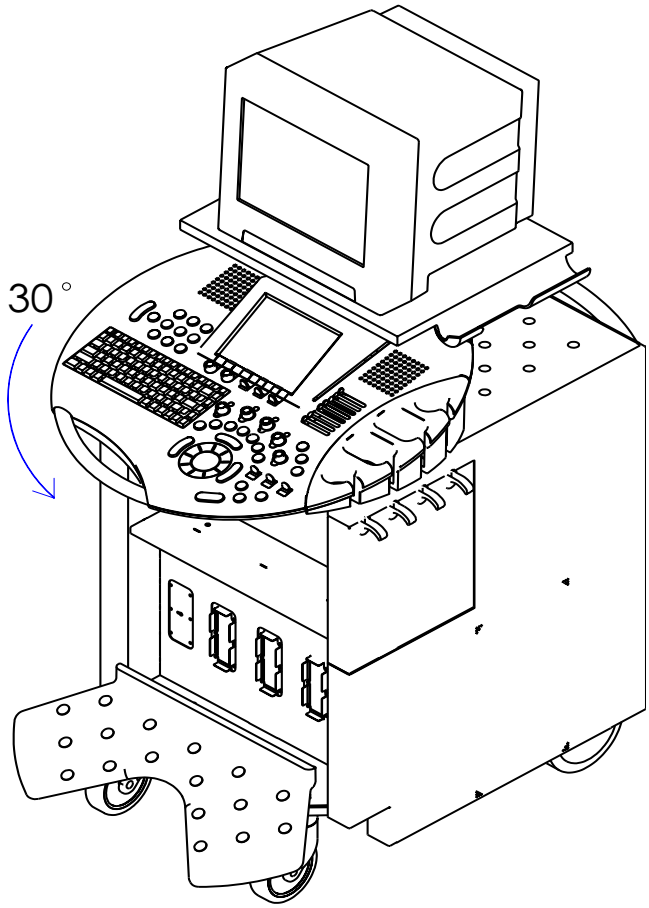


Figure 5-21 Top Console Positioning

5-12-4 Rotation of the Control Console

Locking Bolt
for locking and unlocking the control console

Figure 5-22 Locking Bolt under Control Console

- Horizontal Access: The control panel offers 30° of horizontal adjustment to the right.

5-12-5 Assembly Drawing GW & GEU & Monitor

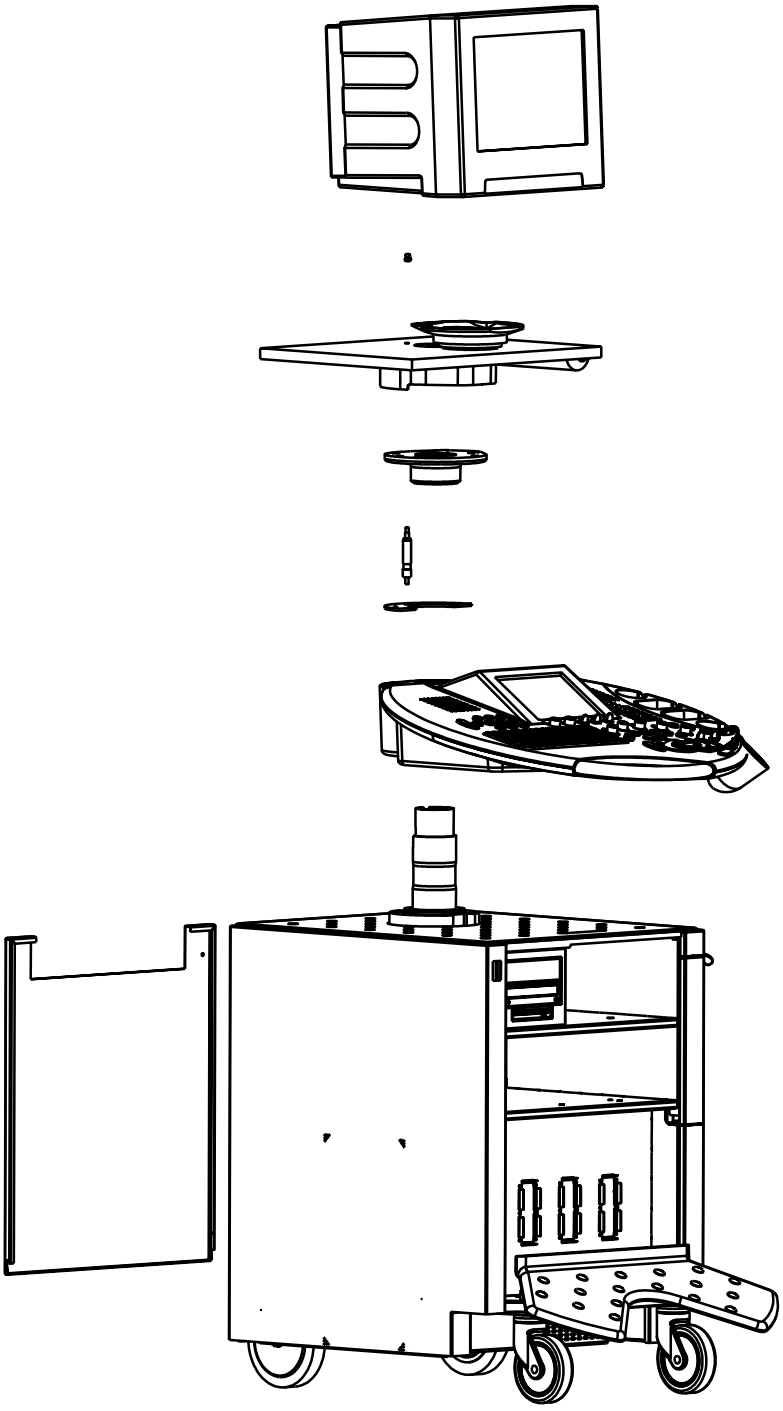


Figure 5-23 Assembly Drawing GW & GEU & Monitor

Section 5-13
Air Flow Control

5-13-1 Air Flow Distribution

The fans at the right side of the Main Board Chassis draw air into the scanner, through the filter grid, and pushes it through the card rack.

Air holes in the left and right side of the rack allow the air to move down through the card rack. Air exits the scanner through holes the Main Air Outlet at the left side panel.

5-13-1-1 Air Flow Distribution Overview:

Figure 5-24 Console Views

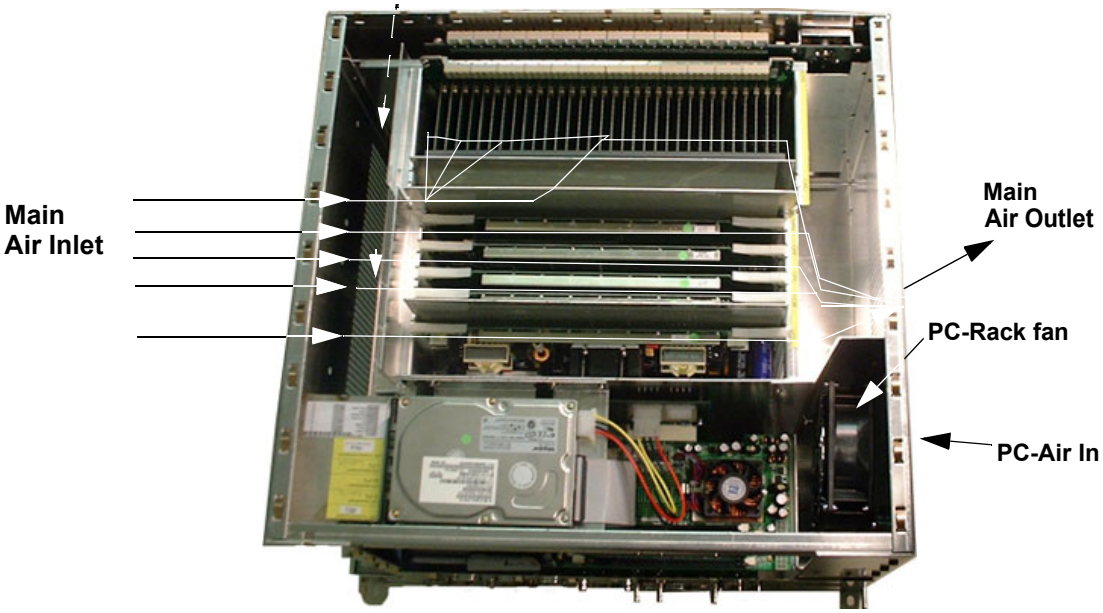


Figure 5-25 Air Flow Control

Section 5-14
Service Page

5-14-1 Introduction

The Service Page contains a set of software modules that will increase service productivity and reduce training and service costs.

5-14-2 Access / Security

The service page has different access and security user levels.
Each user is only granted access to the tools that are authorized for their use.

5-14-3 Service Login

1.) On the Touch Panel, press UTILITIES.
2.) In the Utilities menu, touch SYSTEM SETUP to invoke the setup desktop on the screen.
3.) Select the SERVICE page. The “password window” appears automatically.

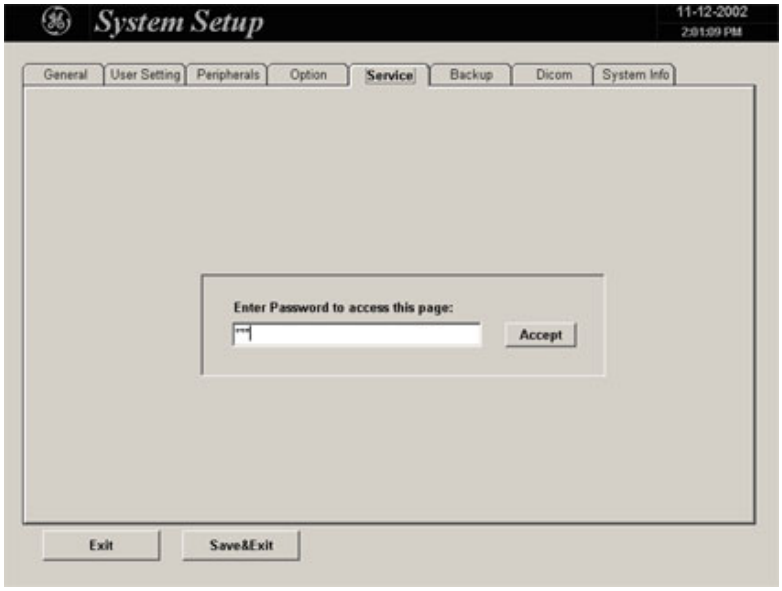


Figure 5-26 System Setup Service page

4.) Enter the password SHE and click the ACCEPT button to display the Service Tools window.

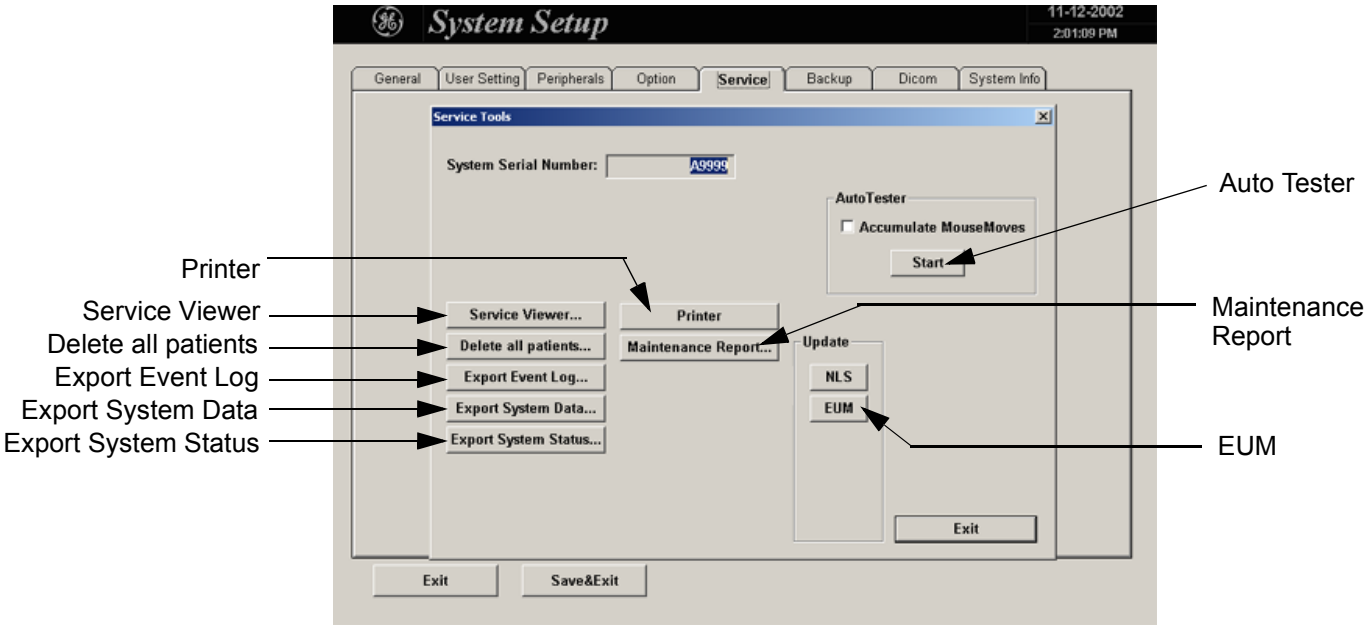


Figure 5-27 Service Tools window

After selecting the corresponding button, following Data's can be requested by the Service Engineers:

5-14-3-1 Auto Tester File

Autotest is a log function of customer activities. It records all user actions (scanning, Touch Panel entries, performing Calculations, review of Patient Reports, etc.…). It is possible to safe (record) as file on HDD. But also export to CD or MOD can be done to allow replay of the records on other units.

⚠ **NOTICE** For intermittent problems this file can be requested from the Service Engineer or customer. It is possible to burn this file on CD or to store it on MO-disk.

Operation see: Section 7-5 "How to use the Auto Tester program" on page 7-5.

5-14-3-2 Service Viewer

Provides common information about System Temperature, Probes, Working hours of system components and probes.

1.) Select the SERVICE VIEWER button to get access to the E-Service page.

Figure 5-28 Kretztechnik E-Service

5-14-3-3 Export System Status

Select this button to export informations about probes, boards, Software, Options and Service Actions to MO or CD Drive.

5-14-3-4 Export Event Log

Select this button to export the Event Log File to MO or CD Drive.

5-14-3-5 Delete all Patients

1.) Click the DELETE ALL PATIENTS... button. Following WARNING message appears on the screen.

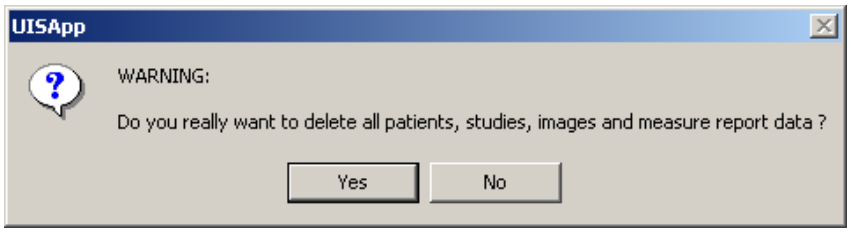


Figure 5-29 Warning message

⚠ **WARNING** ***If you select the YES button, all patients data, studies, images and measure report data will be deleted permanently from the hard disk and cannot be recovered!***

5-14-3-6 Maintenance Report

Any modification upgrade and maintenance action should be entered in this report to get a history of all service actions.

1.) Click the MAINTENANCE REPORT button. The following message box will be displayed.

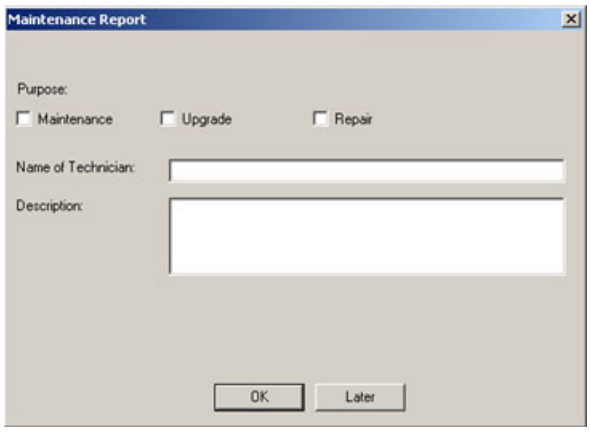


Figure 5-30 Maintenance Report

2.) Fill in the requested information and click OK.

3.) Click the EXIT button on the Service Tools window and the EXIT button on the System Setup Service page.

NOTE: After Hardware or Software modifications normally the "Maintenance Report" message box Figure 5-30 appears automatically on the screen.

5-14-3-7 Export System Data

Select this button to transfer the Service Database to MO or CD Drive.

5-14-3-8 Update

5-14-3-8-1 EUM

is for updating the **E**lectronic **U**ser **M**anual
Operation see: Section 8-3 "EUM (Electronic User Manual) Upgrade Procedure" on page 8-3.

5-14-3-8-2 NLS

Not for use in the field!

5-14-3-9 Printer

Installation of Printers is possible without entering the Windows Desktop.
Operation see: Section 3-5-4 "Printer Installation manually" on page 3-17.

⚠ **WARNING** ***Only accessories explicitly recognized and released by the system manufacturer GE Medical Systems - Kretztechnik may be used in connection with the system.***

Chapter 6
Service Adjustments

Section 6-1
Overview

6-1-1 Purpose of Chapter 6

This chapter describes how to test and adjust the mechanical capabilities of a scanner that may be out of specification. Although some tests may be optional they should only be performed by qualified personnel.

Table 6-1 Chapter 6 Contents

Section	Description	Page Number
6-1	Overview	6-1
6-2	Regulatory	6-1
6-3	Monitor Adjustment	6-2
6-4	Control Console, Transport Lock	6-4
6-5	Trackball Adjustment	6-5

Section 6-2
Regulatory

Verify, where applicable, that any regulatory information or tests required by national law are present and accounted for, and any regulatory tests required by national law are performed *and* documented.

Section 6-3
Monitor Adjustment

Color temperature, Geometry, Size, Picture location, Brightness and Contrast are adjusted using the keys located on the front of the monitor just below the screen.
The screen is degaussed automatically when the power is turned on.

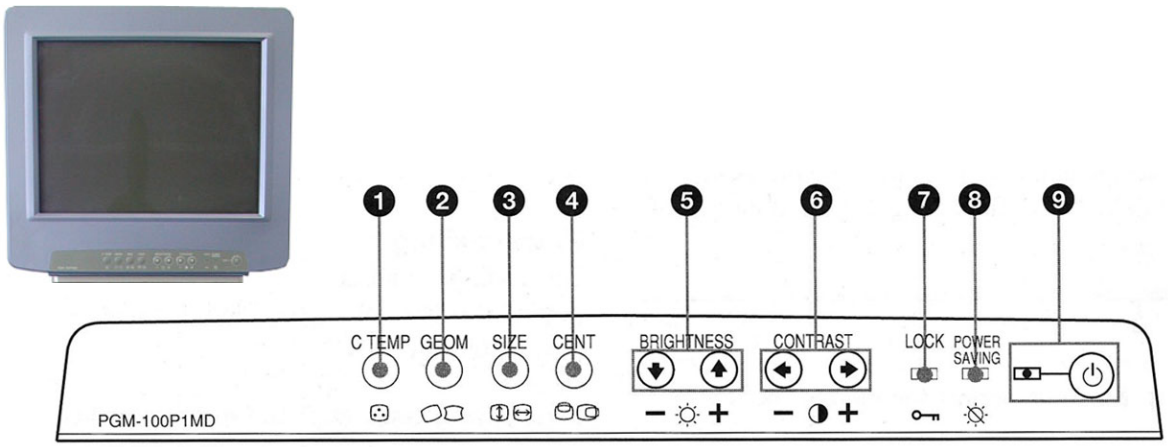


Figure 6-1 Monitor Adjustment buttons

❶ (C TEMP: color temperature) button
Press to show the Color Temperature display on the screen for the color temperature adjustment.

❷ (GEOM: geometry) button
Press to show the Geometry display on the screen for the picture rotation and pincushion distortion adjustments.

❸ (SIZE: picture size) button
Press to show the Size display on the screen for the picture size adjustment.

❹ (CENT: picture location) button
Press to show the Center display on the screen for the picture location adjustment.

❺ ⬇/⬆ (–/+) (BRIGHTNESS) buttons
- Press to show the Contrast/Brightness display on the screen for the picture brightness adjustment.
- Press to adjust the picture brightness, picture location, picture size, picture rotation, and color temperature.

❻ ⬅/➡ (–/+) (CONTRAST) buttons
- Press to show the Contrast/Brightness display on the screen for the picture contrast adjustment.
- Press to adjust the picture contrast, picture location, picture size, pincushion distortion, and color temperature.

❼ (LOCK) indicator
Lights up when the (lock) switch on the rear is set to the upper position (ON). No operation is possible.

❽ (POWER SAVING) indicator
Lights up when the power saving function is used.

❾ (power) switch and indicator
Turns on or off the monitor.
This power switch is a functional on/off switch only. To isolate the monitor from the mains supply, turn off the mains supply switch on the rear panel.
The indicator lights green when the monitor is ready to operate, and lights orange when it is not ready (with the main supply switch turned on).

Figure 6-2 Description of Monitor Adjustment buttons

Section 6-3 Monitor Adjustment (cont'd)

Start Ultrasound application to adjust Monitor setting.

Table 6-2 Recommended Settings

Monitor buttons	Recommended Setting	Remark
C TEMP	select 9300K, 50 windows background should be white	select UTILITIES, SYSTEM SETUP and click the DATE/TIME button on the "General" page and look at background of calender
GEOM	no pincushion distortion no picture rotation	Monitor is pre-adjusted; minor distortion is normal and can be corrected with the GEOM function.
SIZE	video display fills up full screen	
CENT	video centered left and right margin equal	

Table 6-3 Brightness / Contrast Settings

Room Condition	Monitor Adjustment	
	Brightness	Contrast
Dark Room for Obstetrics	55	55
Dim Room for Obstetrics	62	65
Bright Room for Obstetrics	72	75
Dim Room for Radiology	70	70

Section 6-4
Control Console, Transport Lock

6-4-1 Control Console

The control console can be rotated 30° to the right.

When rotating the control console grasp it only on the front grip of the user interface.

Locking Bolt
for locking and unlocking the control console

Figure 6-3 Locking Bolt under Control Console

1.) Push the bolt under the control console forward.
2.) Rotate the console to wanted position.

6-4-2 Transport Lock

There is a locking bolt for locking and unlocking the control console, mounted at the front below the control console. When preparing the system for transport, the lock has to be engaged in order to secure the console against uncontrolled rotation. The lock catches in when the console is rotated to its center 0° position.

WARNING ***Do not put your hand between the control console and the Main unit when moving the console to the 0 position: Danger of injuries!***

Section 6-5
Trackball Adjustment

Adjustment of the mechanical movement may be necessary to ensure smooth running of the trackball.

1.) Remove the outer fixing ring by turning it counterclockwise.

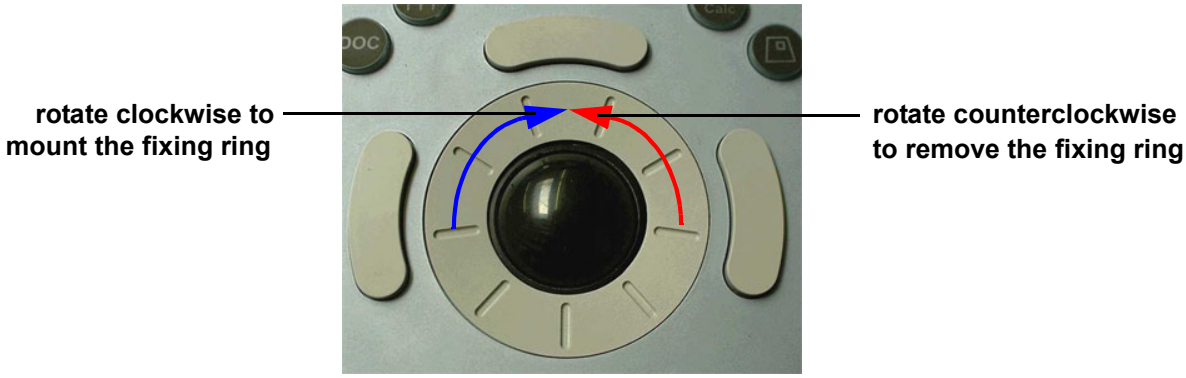


Figure 6-4 Trackball with fixing ring

2.) Adjust the trackball for smooth running by rotating the black securing ring.

- CCW: smooth run
- CW: tighten run

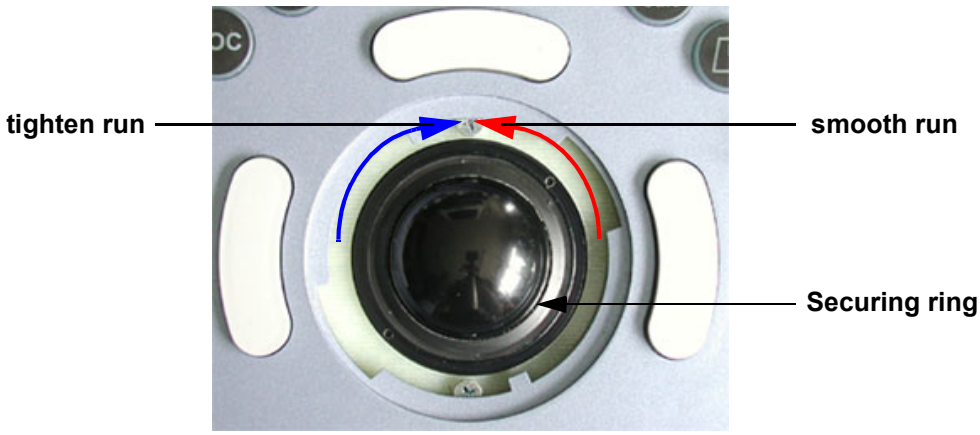


Figure 6-5 Trackball - Securing Ring

⚠ **NOTICE** Avoid tightening of thread caused by improper mounting of securing ring!

3.) Mount the outer fixing ring by turning it clockwise. see Figure 6-4.

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Chapter 7
Diagnostics/Troubleshooting

Section 7-1
Overview

7-1-1 Purpose of Chapter 7

This section describes how to setup and run the tools and software that help maintain image quality and system operation. Basic host, system, and board level diagnostics are run whenever power is applied. Some Service Tools may be run at the application level.

7-1-2 Overview

There may be a time when it would be advantageous to capture trouble images and system data (logs) for acquisition through remote diagnostics (InSite) or to be sent back to the manufacturer for analysis. There are different options to acquire this data that would give different results.

Table 7-1 Contents in Chapter 7

Section	Description	Page Number
7-1	Overview	7-1
7-2	Collect Vital System Information	7-2
7-3	Check Points Voltages	7-3
7-4	Screen Captures and Logs	7-4
7-5	How to use the Auto Tester program	7-5
7-6	Minimum Cable Configuration to Boot	7-8
7-7	Troubleshooting Trees and Instructions	7-10
7-8	Error Messages	7-20

Section 7-2
Collect Vital System Information

The following information is necessary in order to properly analyze data or images being reported as a malfunction or being returned to the manufacturer:

⚠ **NOTICE** Voluson® 730 can have two different serial numbers!

1.) System Serial number

- External number - Label on back of the system
- Internal number - Touch UTILITIES, then SYSTEM SETUP and select the SYSTEM INFO page.

2.) Applications Software

Touch UTILITIES, then SYSTEM SETUP and select the SYSTEM INFO page.

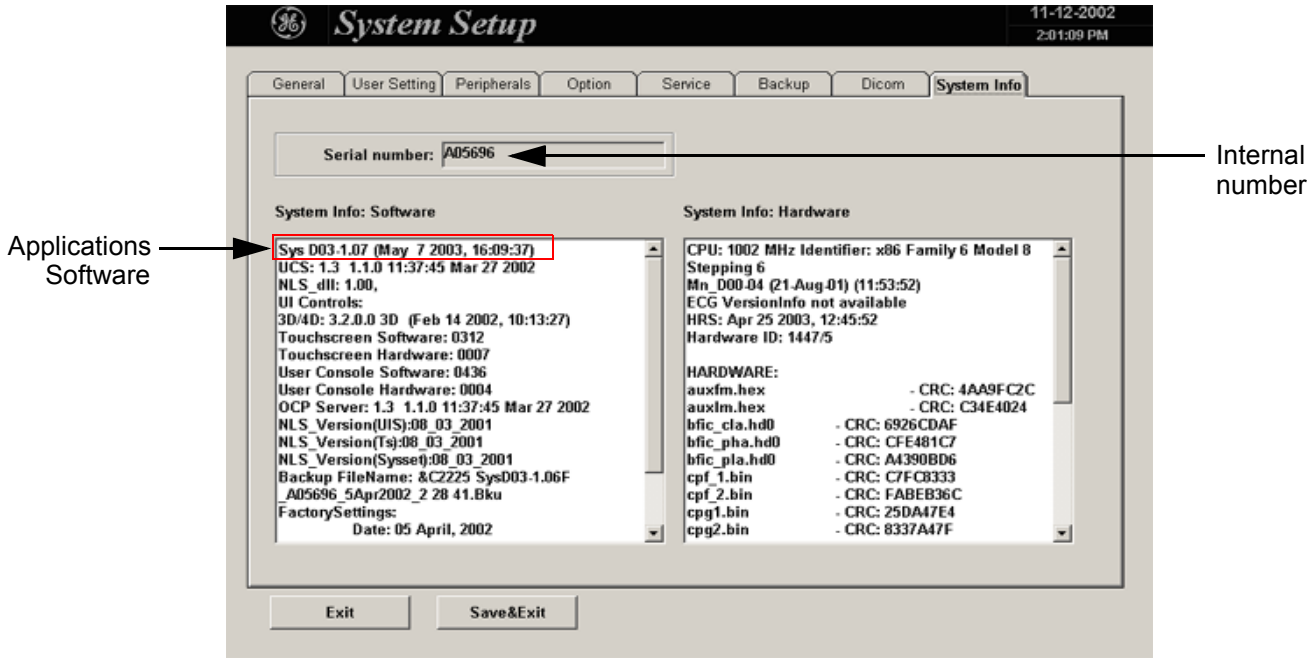
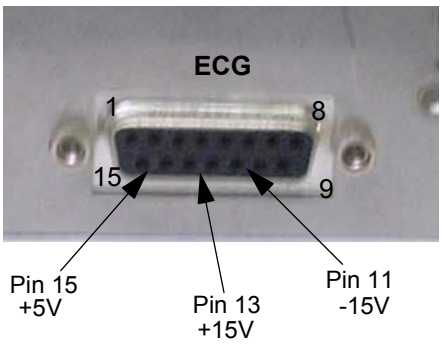


Figure 7-1 System Serial Number

Section 7-3
Check Points Voltages

7-3-1 How to check power

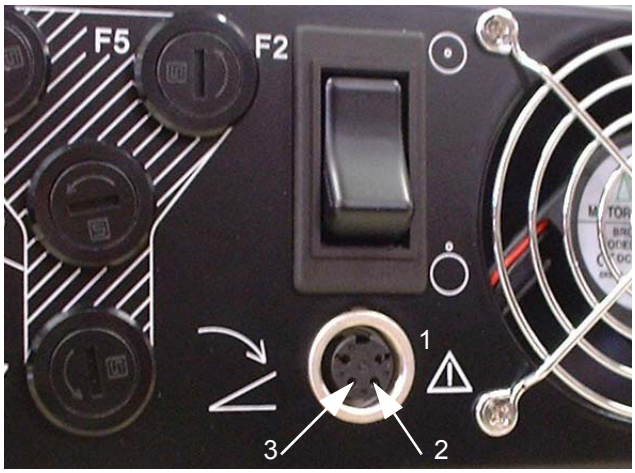


Check above Voltages with DVM to Ground (Backpanel of GEF)

Pin 1
+12V

Check above Voltage with DVM to Ground
(SCSI Power-Connector Backpanel of GEF)

Check with DVM (Digital Volt Meter) the 58V/DC
(Power Connection-Cable from CPN to GEF)



Check Voltage with DVM to Ground

both Pins 2 and 3 are + 3.3V
Pin 1 is Ground

Figure 7-2 Connectors

Section 7-4
Screen Captures and Logs

There may be times when the customer or field engineer want to capture a presentation on the screen so it may be recovered by the OnLine Center. This is accomplished by saving the image(s) to Sonoview and export them to CD-Rom.

7-4-1 Capturing a screen

Only possible if SonoView Option is enabled.

The following is the generic process to capture any screen from the scanner.

1.) Navigate to and display the image/screen to be captures.
2.) Press **SAVE** button and save the image to SonoView.
3.) Select the stored image(s) in SonoView (Exam List) and export the image(s) to CD-Rom (jpg, bmp or tiff)

7-4-2 Export Log's and System Data's

Touch UTILITIES, then SYSTEM SETUP and select the SERVICE page.

Type in the password SHE and click the ACCEPT button.

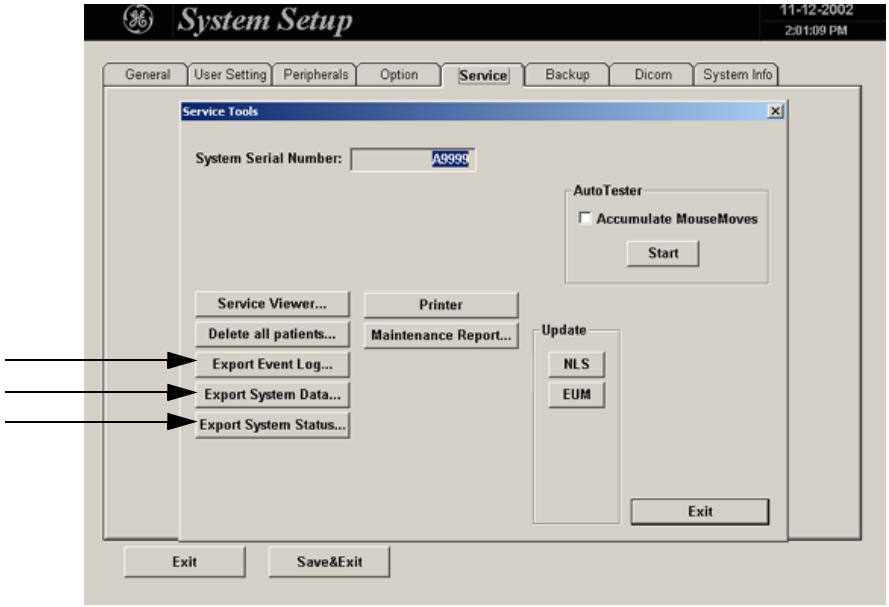


Figure 7-3 Service Tools

7-4-2-1 Export Event Log

Exports Event Log File to MO or CD Drive.

7-4-2-2 Export System Data

Transfer Service Database to MO or CD Drive.

7-4-2-3 Export System Status

This function exports information about probes, boards, SW, Options Service Actions to MO or CD Drive.

Section 7-5
How to use the Auto Tester program

1.) Touch UTILITIES and SYSTEM SETUP on the Touchscreen.
2.) Select the SERVICE page on the screen.

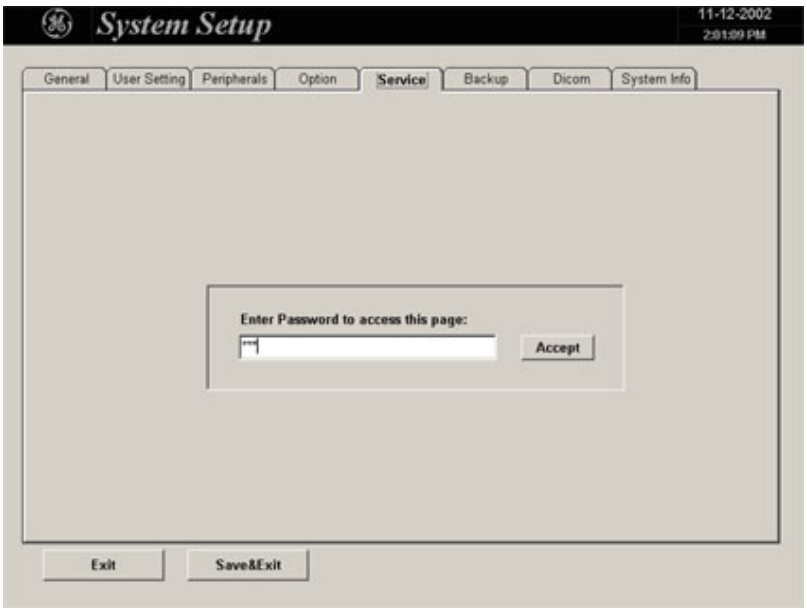


Figure 7-4 System Setup Service

3.) Type in the password SHE and click ACCEPT. The following screen appears.

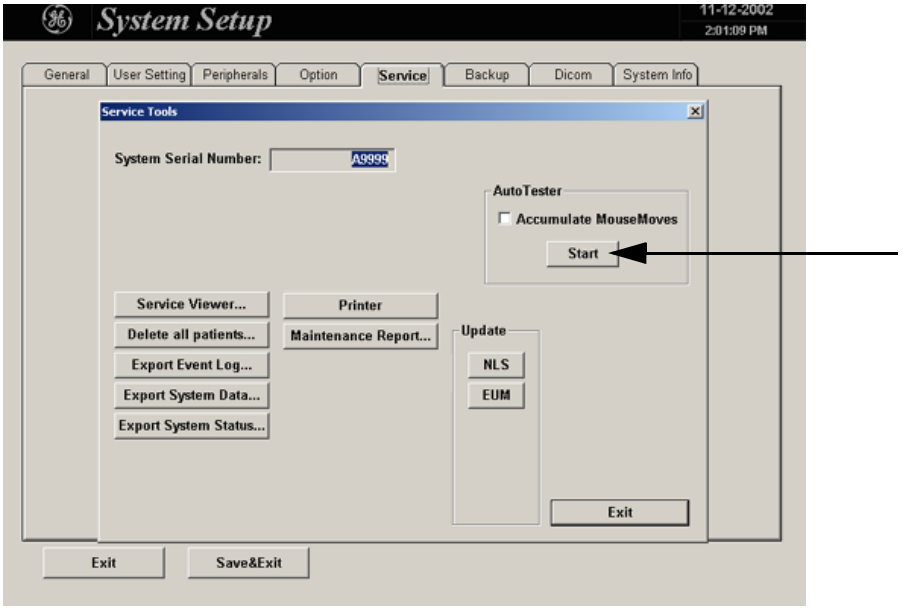


Figure 7-5 Service Tools

4.) Activate the “Auto Tester” program by clicking START.

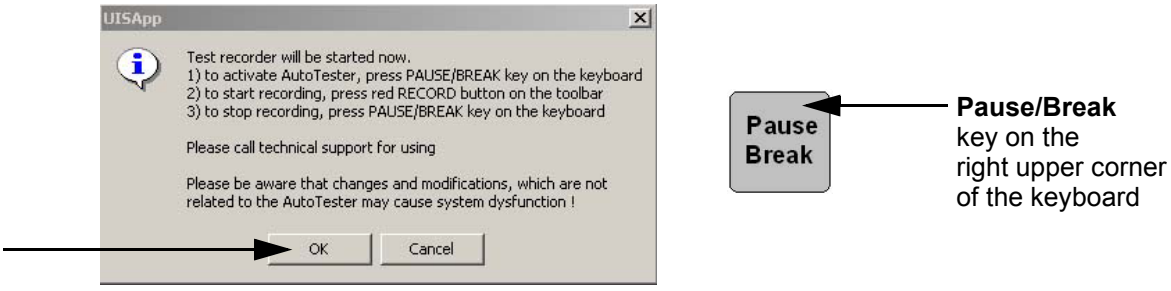

UISApp
Test recorder will be started now.
1) to activate AutoTester, press PAUSE/BREAK key on the keyboard
2) to start recording, press red RECORD button on the toolbar
3) to stop recording, press PAUSE/BREAK key on the keyboard
Please call technical support for using
Please be aware that changes and modifications, which are not related to the AutoTester may cause system dysfunction !
OK
Cancel
Pause Break
Pause/Break key on the right upper corner of the keyboard

Figure 7-6 Message Box

5.) Click OK.

6.) Press the **PAUSE/BREAK** key on the keyboard.

7.) Activate the “Auto Tester” program by clicking the “Record” icon on the displayed screen.

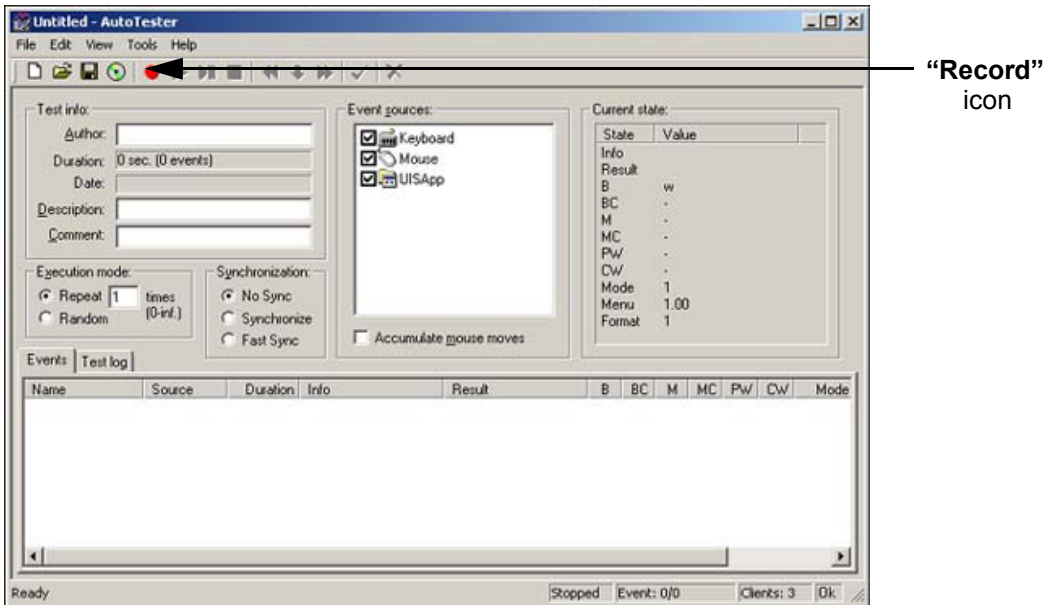


Figure 7-7 Start Auto Tester

8.) Start scanning.
You can scan normally and everything will be recorded to the program (up to several hours.)

NOTE: It is important that you are recording the processes where the errors normally occur.

9.) Stop the program by pressing the **PAUSE/BREAK** key on the right upper corner of the keyboard.

The following screen will appear.

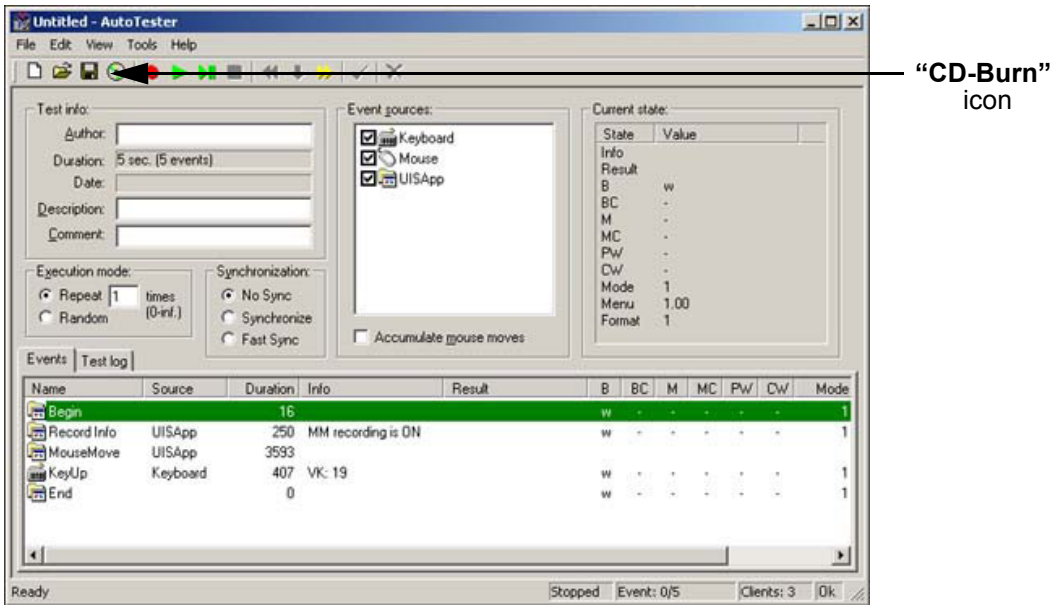


Figure 7-8 Auto Tester Finished

10.)Insert an empty CD-RW in the Drive and select the "CD-Burn" icon.

11.)Enter a Filename.

Figure 7-9 Enter a Filename

12.)After clicking OK, the following message boxes will appear.

Figure 7-10 CD-Burn Process

13.)After the CD write is finished click the OK button and close the "Auto Tester" program.

Section 7-6
Minimum Cable Configuration to Boot

Following Cables must be connected for minimum Configuration:
see: *Figure 7-11: Cable- Minimum configuration*

a.) RS232-1 (connector for User Interface, near to the Mouse connector)

NOTE: Don´t mix up the RS232-1 with the RS232-2 and RS232-3 connectors.

b.) VGA (Monitor)
c.) CPN (Primary Power Supply)
d.) Console
e.) Stand By switch
f.) Monitor Power Supply
g.) Mouse (connector for Mouse/Keyboard)

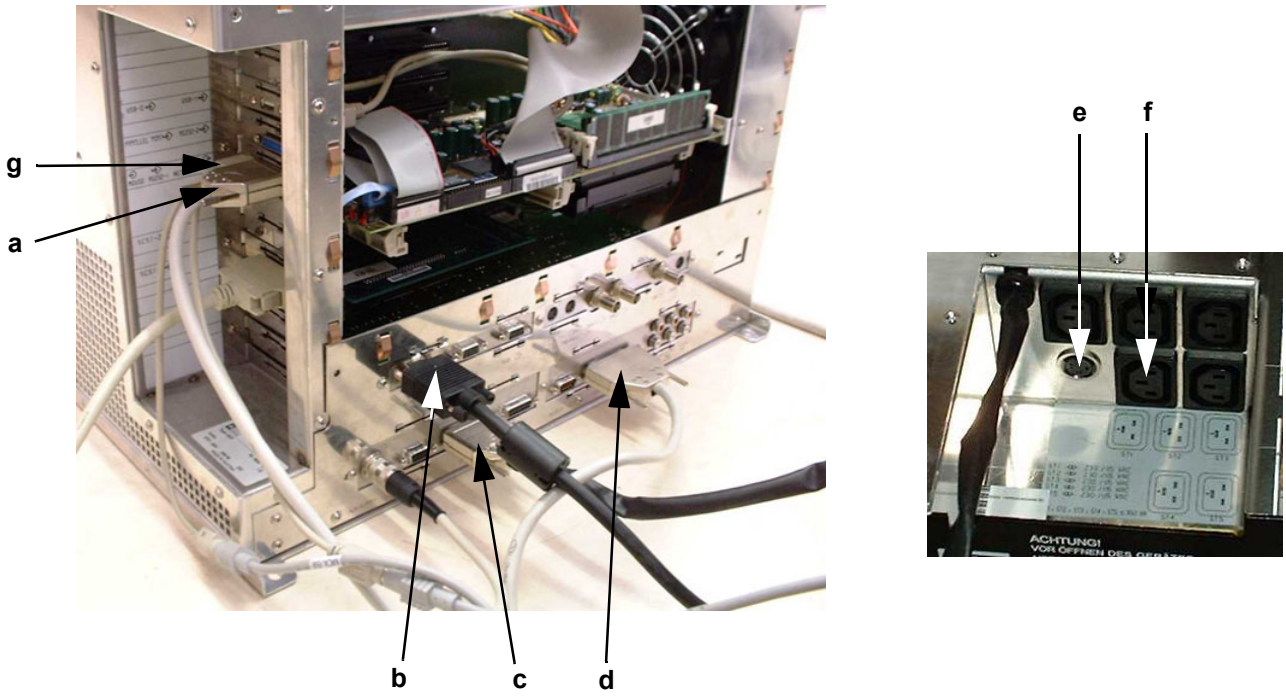


Figure 7-11 Cable- Minimum configuration

7-6-1 Minimum Cable Configuration to Scan

Following Cables must be connected for minimum Configuration:
see: *Figure 7-11: Cable- Minimum configuration*

a.) RS232-1 (connector for User Interface, near to the Mouse connector)

NOTE: Don't mix up the RS232-1 with the RS232-2 and RS232-3 connectors.

b.) VGA (Monitor)
c.) CPN (Primary Power Supply)
d.) Console
e.) Stand By switch
f.) Monitor Power Supply
g.) Mouse (connector for Mouse/Keyboard)
h.) Probes

Section 7-7
Troubleshooting Trees and Instructions

7-7-1 System does not Power On / Boot Up

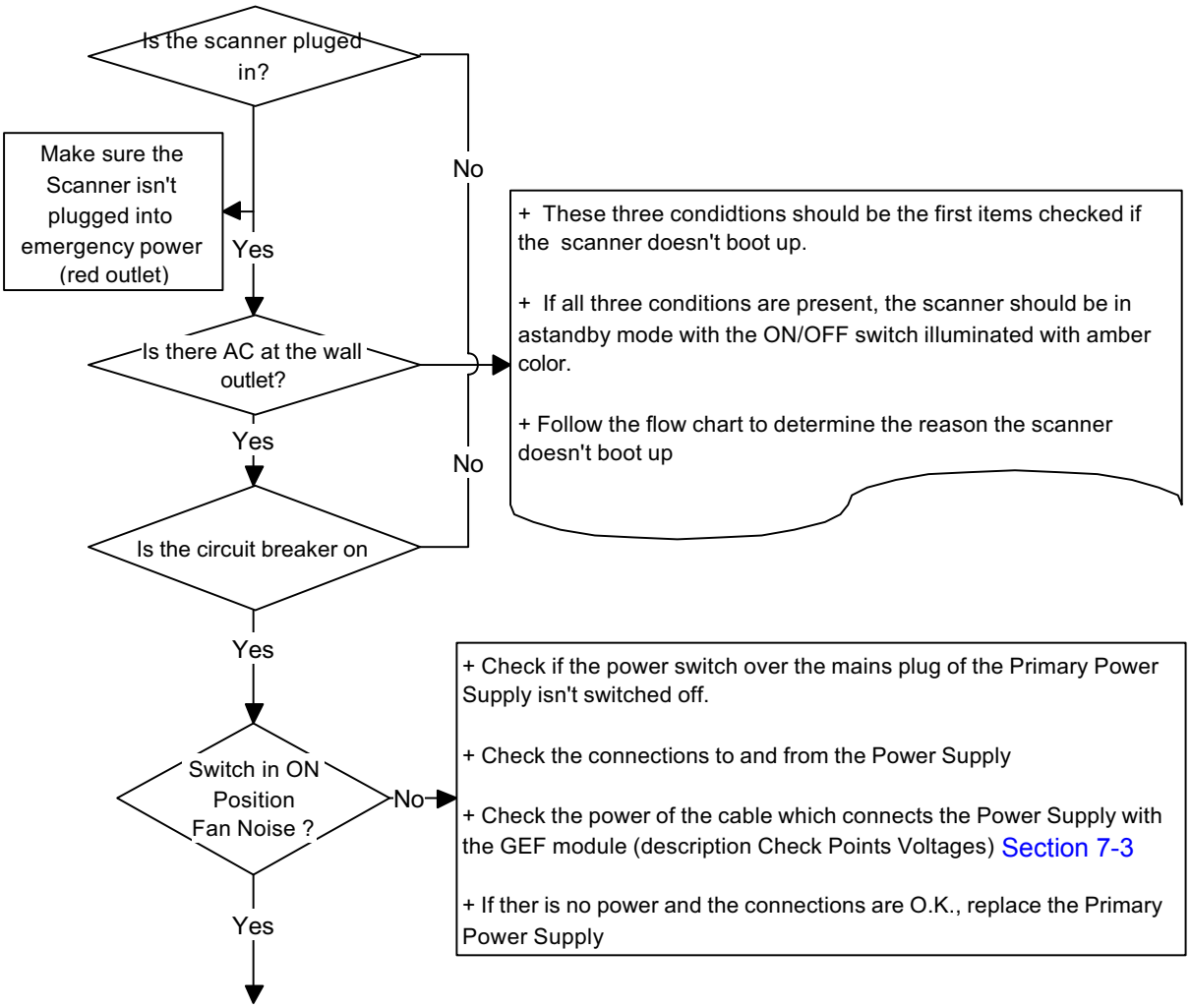

Is the scanner pluged in?
No
Make sure the Scanner isn't plugged into emergency power (red outlet)
Yes
+ These three condidtions should be the first items checked if the scanner doesn't boot up.
+ If all three conditions are present, the scanner should be in astandby mode with the ON/OFF switch illuminated with amber color.
+ Follow the flow chart to determine the reason the scanner doesn't boot up
Is there AC at the wall outlet?
Yes
No
Is the circuit breaker on
Yes
+ Check if the power switch over the mains plug of the Primary Power Supply isn't switched off.
+ Check the connections to and from the Power Supply
+ Check the power of the cable which connects the Power Supply with the GEF module (description Check Points Voltages) Section 7-3
+ If ther is no power and the connections are O.K., replace the Primary Power Supply
Switch in ON Position Fan Noise ?
No
Yes
System is on and ready for use

Figure 7-12 System does not boot up

7-7-2 Noise in Image

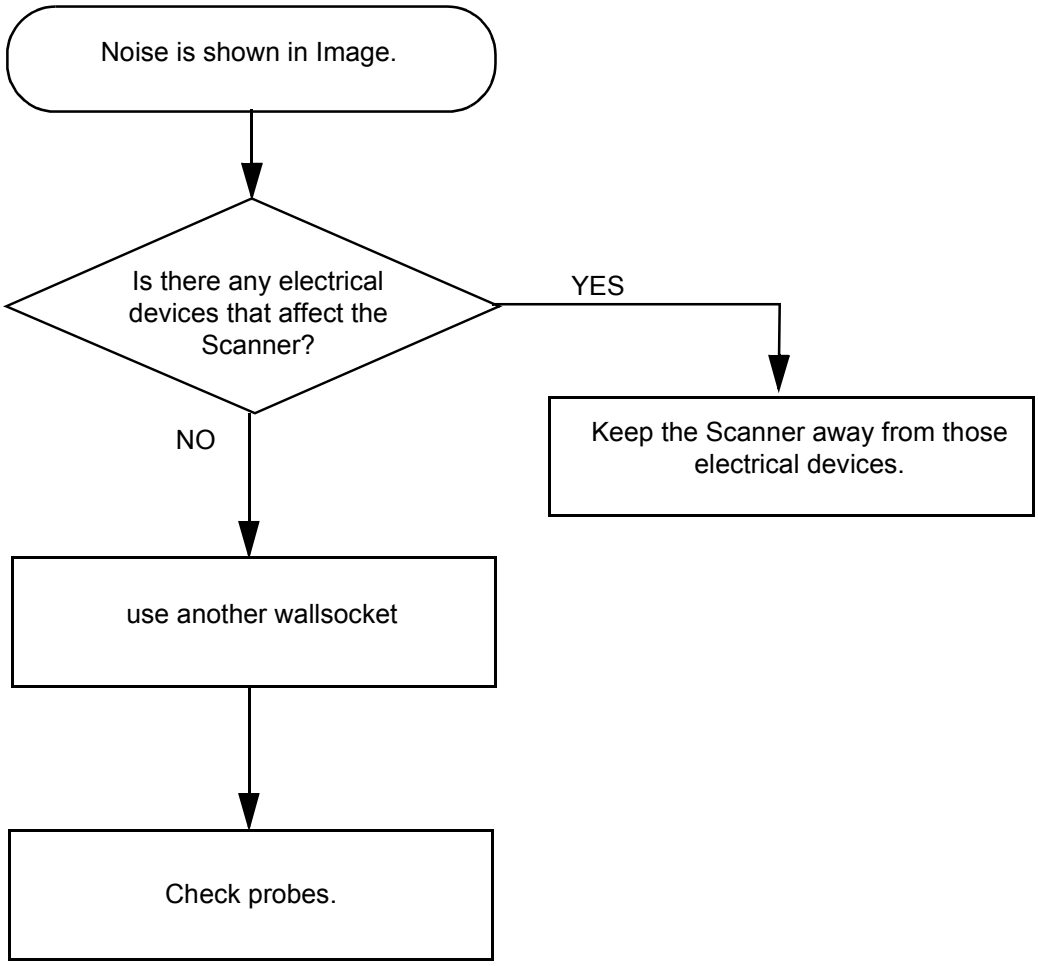

Noise is shown in Image.
Is there any electrical devices that affect the Scanner?
YES
Keep the Scanner away from those electrical devices.
NO
use another wallsocket
Check probes.

Figure 7-13 Noise in Image

7-7-3 Trackball

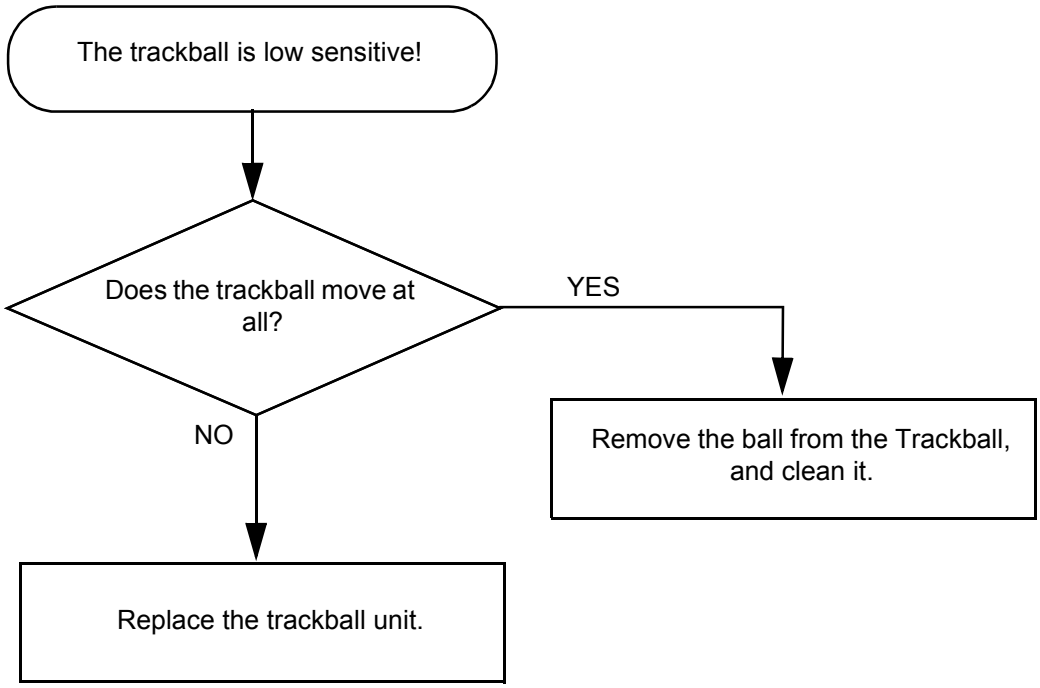

The trackball is low sensitive!
Does the trackball move at all?
YES
NO
Remove the ball from the Trackball, and clean it.
Replace the trackball unit.

Figure 7-14 Trackball Troubleshooting

7-7-4 System does not Power Off / Shutdown

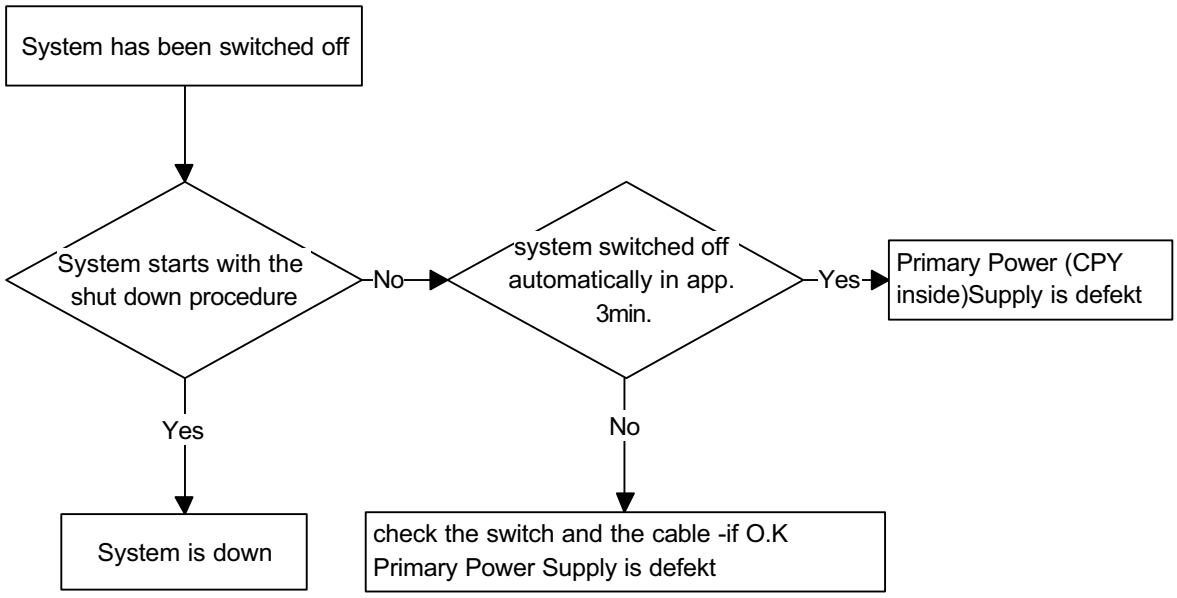

System has been switched off
System starts with the shut down procedure
No
system switched off automatically in app. 3min.
Yes
Primary Power (CPY inside)Supply is defekt
Yes
No
System is down
check the switch and the cable -if O.K
Primary Power Supply is defekt

Figure 7-15 Power Off / Shutdown - Troubleshooting

7-7-5 Monitor Troubleshooting

Fault symptom		Check these items
No Image	If neither the Power Indicator nor Power Saving is lit	+ Check the power cord is properly connected + Check the mains supply switch is set to the "On" position
	If the Power Saving Indicator is lit	+ Check the video cable is properly connected + Check no pins of the video cable are bent
	If the Power Indicator is flashing alternately green and orange, and the Power Saving Indicator is flashing	+ There is a potential monitor failure. Contact your dealer
Color is not uniform		+ Turn on the power to activate the Auto-Degauss function
Screen image is not centered or sized properly		+ Adjust the picture location, picture size, picture rotation, or pincushion distortion + Some video modes do not fill the screen to the edge of the monitor There is no single answer to solve the problem. This phenomenon may occur on higher refresh rates (vertical frequency)
Picture is fuzzy		+ Adjust the picture contrast and picture brightness. Some SVGA cards having an excessive video output level will cause a fuzzy picture at the maximum contrast level + Turn on the power to activate the Auto-Degauss function + The video cable is connected to the video output connectors on the rear, but the other ends of the video cable are not connected to another monitor In this case, the video output level increases and makes the picture fuzzy. So, disconnect the video cable, or connect the other ends of the video cable to another monitor

Figure 7-16 Monitor Troubleshooting

7-7-6 Unable to Record to VCR

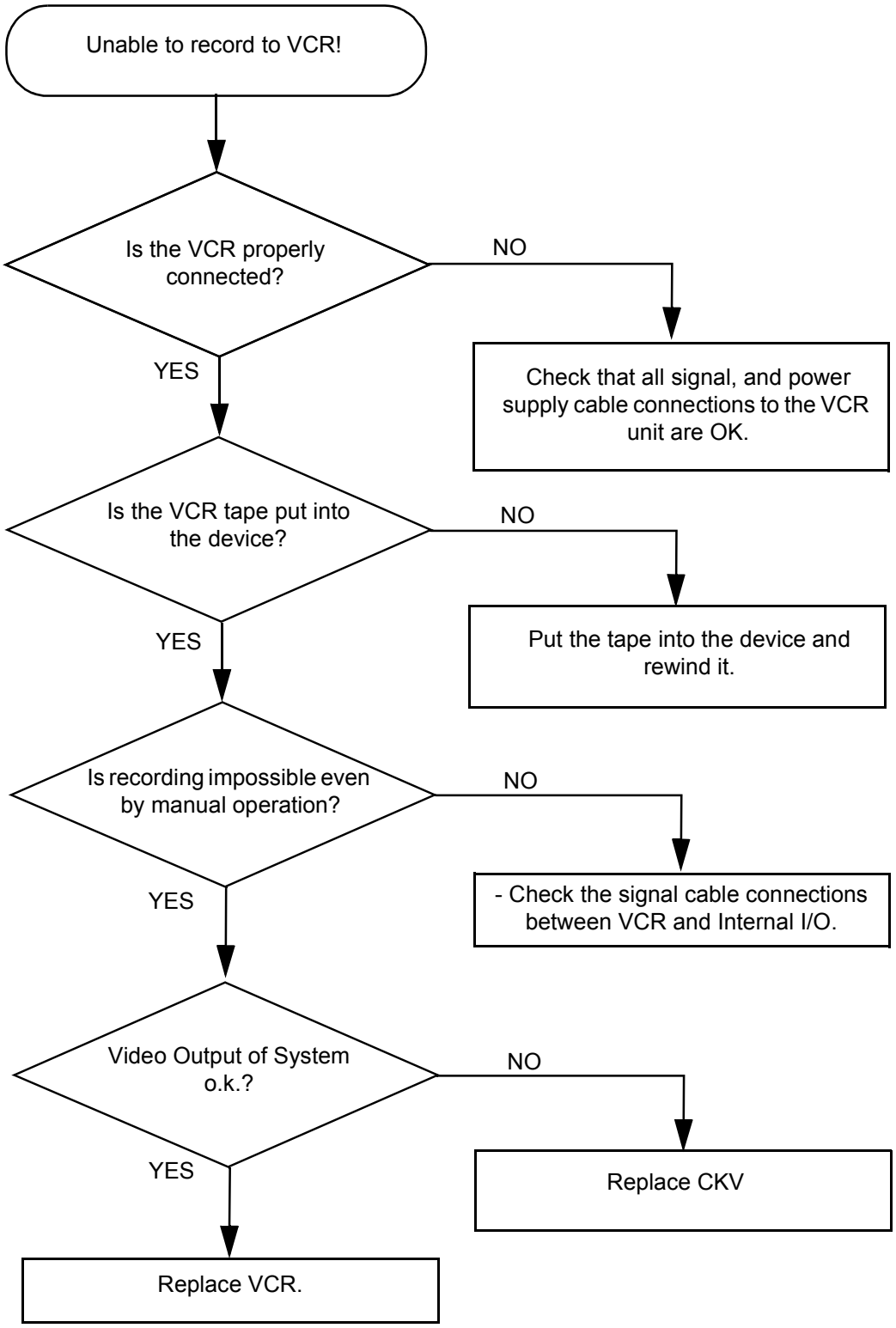

Unable to record to VCR!
Is the VCR properly connected?
NO
Check that all signal, and power supply cable connections to the VCR unit are OK.
YES
Is the VCR tape put into the device?
NO
Put the tape into the device and rewind it.
YES
Is recording impossible even by manual operation?
NO
- Check the signal cable connections between VCR and Internal I/O.
YES
Video Output of System o.k.?
NO
Replace CKV
YES
Replace VCR.

Figure 7-17 VCR Troubleshooting

7-7-7 Printer Troubleshooting

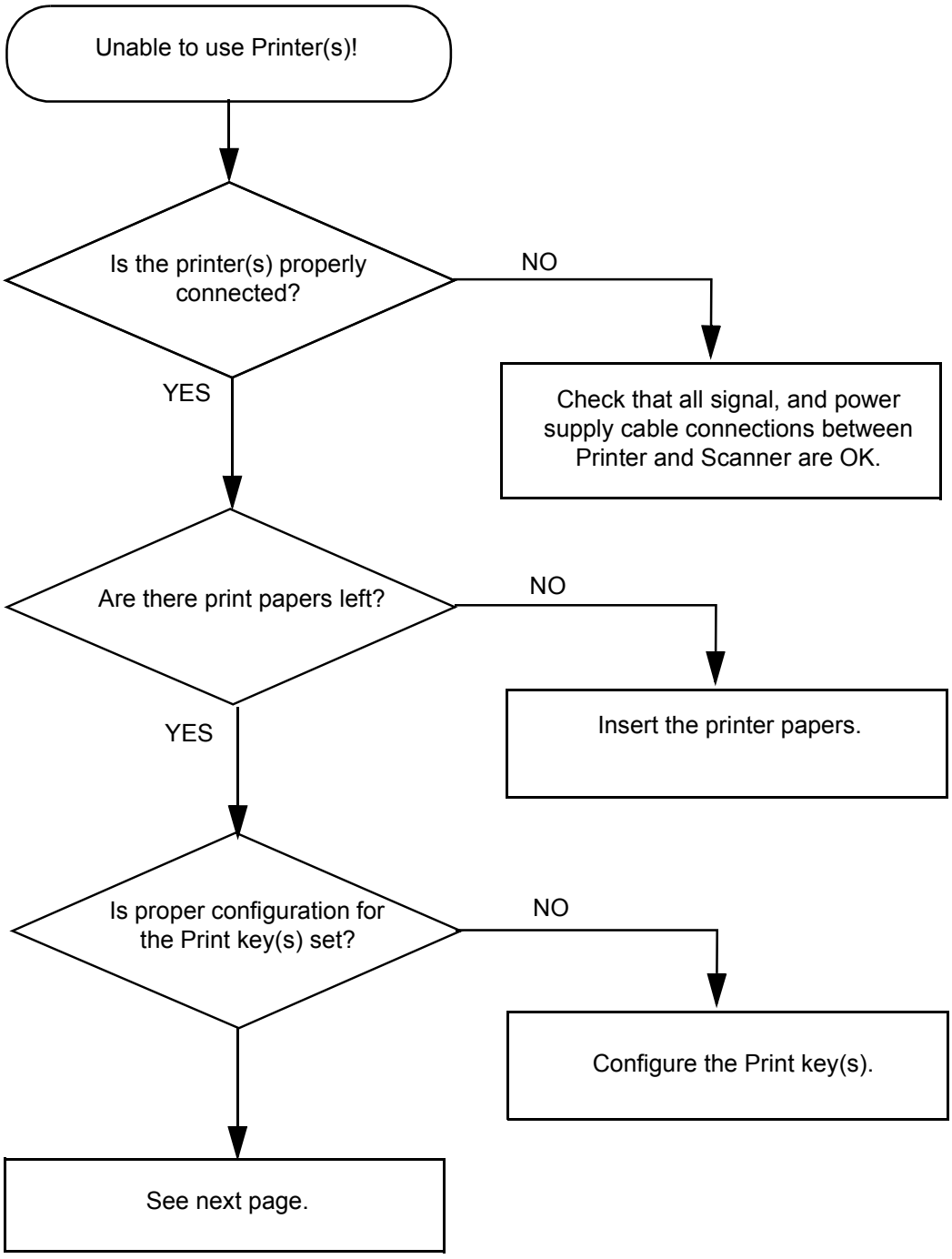

Unable to use Printer(s)!
Is the printer(s) properly connected?
NO
Check that all signal, and power supply cable connections between Printer and Scanner are OK.
YES
Are there print papers left?
NO
Insert the printer papers.
YES
Is proper configuration for the Print key(s) set?
NO
Configure the Print key(s).
See next page.

Figure 7-18 Printer Troubleshooting

7-7-7 Printer Troubleshooting (cont'd)

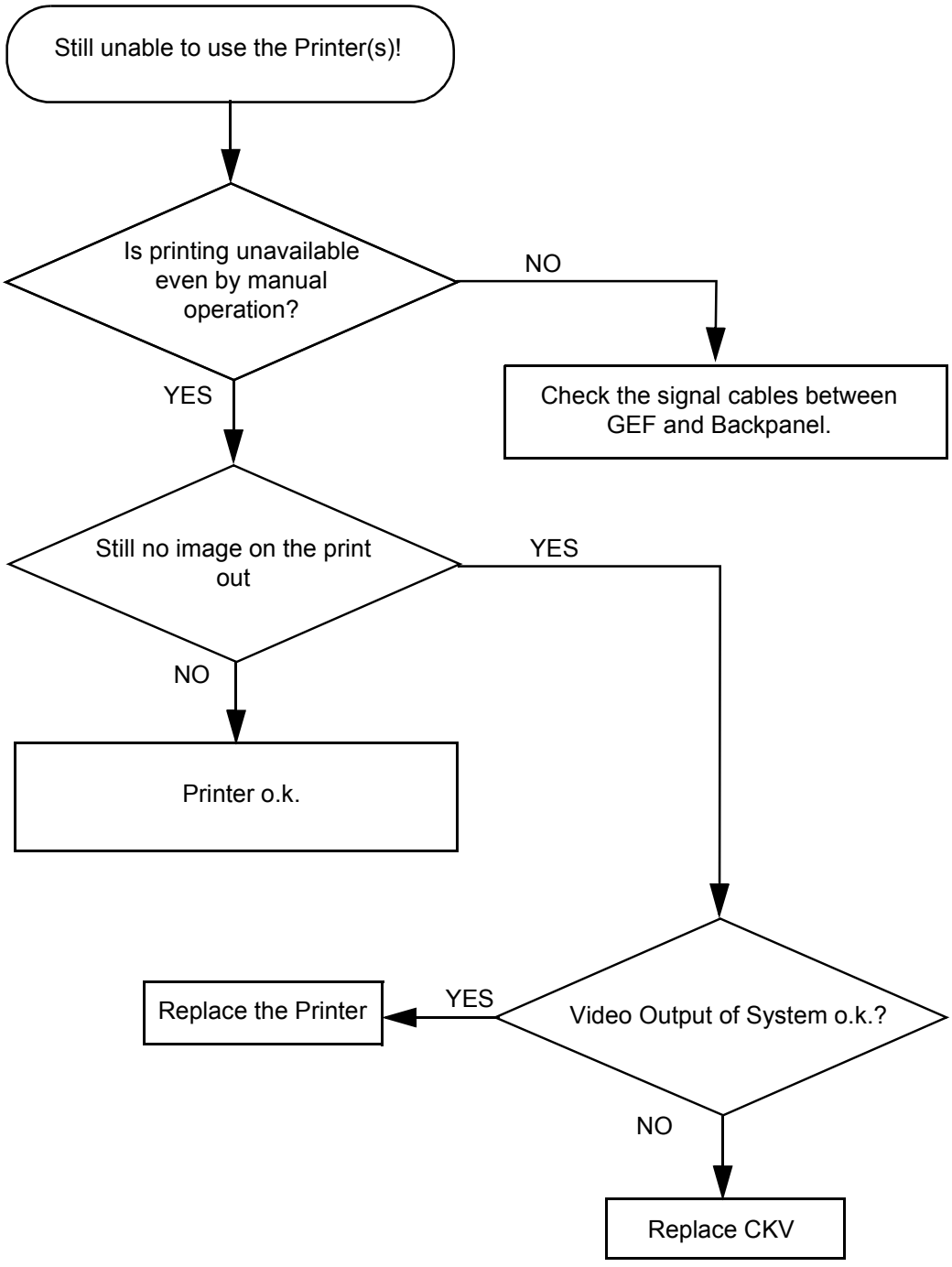


Figure 7-19 Printer Troubleshooting (cont´d)

7-7-7-1 CD-RW Troubleshooting (CD-Rom Drive)

1.) Insert an empty CD-RW into the Drive.
2.) Enter “Sonoview” by pressing the **NETWORK** key on the control panel; see Figure 7-20.
3.) Click the “Open” icon to display the list of exams.
4.) Select exam(s) and backup them to CD-ROM.
5.) Choose “CD-ROM” Drive.
6.) The images, which you have chosen during backup should be visible.

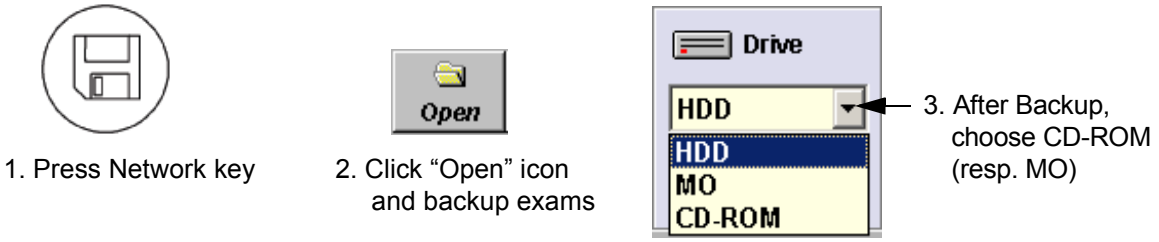


Figure 7-20 To backup exams to CD-ROM resp. MO-Disk

7-7-8 MOD Troubleshooting

1.) Insert an empty MO into the Drive.
2.) Enter “Sonoview” by pressing the **NETWORK** key on the control panel; see Figure 7-20.
3.) Click the “Open” icon to display the list of exams.
4.) Select exam(s) and backup them to MO.
5.) Choose “MO” Drive.
6.) The images, which you have chosen during backup should be visible.

7-7-9 Audio Test

Preparations for Audio Test: Start a probe and select the PW-Mode.

Change the volume from 0 to 96dB with the digipot and listen if both loudspeakers are making some noise.

7-7-10 Network Troubleshooting

7-7-10-1 No Connection to the Network at All

1.) Check that the network cable between the scanner and the wall network is connected and well seated in both ends.

2.) Try a network cable that is known to be OK.

3.) Check the cable between the network-connector on the Back Panel to the LAN-connector on the GEF.

4.) Connect a network cable between your Scanner and your PC. Try to ping from the Scanner to the IP address on the PC. If OK, the hardware connection inside the Scanner is OK.

Section 7-8
Error Messages

Error Messages	Actions
530-Probe connected on…….	Disconnect and reconnect the probe. If error remains don't use such a probe.
Array bounds exceeded	restart the system
Attempt to read Probe-ID from an invalid probe connector.	Reboot system.
AVI Save function fails	check the SCSI and the Power cable - restart the machine and try again
B_Enhance Out Of Range	Press ok and save this user-setting once again
B_Gain Out Of Range	Press ok and save this user-setting once again
B_Reject Out Of Range	Press ok and save this user-setting once again
B_TxFocus - not calculated and B_SHOT_PART_ON	restart the system, If after restart not ok then call technical support
BC lines_per_sequenz < 1	restart the system
BC lines_per_sequenz < 2	restart the system
BC_Dynamic Out Of Range	Press ok and save this user-setting once again
BC_Gain Out Of Range	Press ok and save this user-setting once again
BC_Lines: BC_LineDensity out of limit	restart the system
BCMC_Balance Out Of Range	Press ok and save this user-setting once again
BC-TxPower Out Of Range	Press ok and save this user-setting once again
BF: can't set BM RxApod	restart the system, If after restart not ok then call technical support
BF: can´t set C Rx Apod	restart the system, If after restart not ok then call technical support
BF: can't set D RxApod	restart the system, If after restart not ok then call technical support
BM_Resample: overrun SampleLengthOnLineMem	restart the system
Cannot read a valid Probe-ID (%02X) from…….	Disconnect and reconnect the probe
Cannot write Probe-ID into EEPROM on left probe connector (A).	connect the probe once more, if not ok call technical support
Cannot write Probe-ID into EEPROM on left probe connector (B).	connect the probe once more, if not ok call technical support
Cannot write RotatingAngleCorr into EEPROM on left probe connector (A).	connect the probe once more, if not ok call technical support
Cannot write RotatingAngleCorr into EEPROM on left probe connector (B).	connect the probe once more, if not ok call technical support

Error Messages	Actions
Cannot write RotatingAngleCorr into EEPROM on left probe connector (C).	restart the system, call technical support
Cannot write RotatingShiftCorr into EEPROM on left probe connector (A).	connect the probe once more, if not ok call technical support
Cannot write RotatingShiftCorr into EEPROM on left probe connector (B).	connect the probe once more, if not ok call technical support
Cannot write RotatingShiftCorr into EEPROM on left probe connector (C).	connect the probe once more, if not ok call technical support
Cannot write SNO into EEPROM on left probe connector (A).	connect the probe once more, if not ok call technical support
Cannot write SNO into EEPROM on left probe connector (B).	connect the probe once more, if not ok call technical support
Cannot write SNO into EEPROM on left probe connector (C).	connect the probe once more, if not ok call technical support
Cannot write Start Date into EEPROM on left probe connector (A).	connect the probe once more, if not ok call technical support
Cannot write Start Date into EEPROM on left probe connector (B).	connect the probe once more, if not ok call technical support
Cannot write Start Date into EEPROM on left probe connector (C).	connect the probe once more, if not ok call technical support
CANNOT_IMPORT_VOLUME_DATA_TO_3D_DLL	Load volume files from other storage medium.
Can't import session	use a new CDR to write data to CD
can't open MotCtrl RS232 Serial connection	restart the system
Can't open:	restart the system
Can't open: \\Path \initcpf.tst	restart the system
Can't open: \\Path \initmid.tst	restart the system
Can't open: \\Path \trans2.bin	restart the system
Can't open: c:\\mid\\	restart the system
CD write error	use a new CDR
Communication thread is dead!	restart the system
Compound: too many RxFrqResp.	restart the system
CW quant TxFreq out of range	restart the system
CW_BaseLinePos Out Of Range	Press ok and save this user-setting once again
CW_Gain Out Of Range	Press ok and save this user-setting once again
CW-hardware doesn't support	pencil probe + CW-Hardware not available->HW problem
CW-HW-PRF == 0	restart the system
CW-TxFrequency == 0	restart the system
CW-TxPower Out Of Range	Press ok and save this user-setting once again

Error Messages	Actions
Datatype misalignment	restart the system
Density Out Of Range	Press ok and save this user-setting once again
DFE:Block with openInput	restart the system
Disc full !	use a new CDR for writing data to CD
Display:Rect Region fails	restart the system
Division by zero	restart the system
done is low !	restart the system
DSP - Gamma Corr - Load Data Timeout	restart the system
DSP - HilbertCoeff - Load Data Timeout	restart the system
DSP - Low Pass Coeff - Load Data Timeout	restart the system
DSP - SetFFT_Para - Load Data Timeout	restart the system
DSP - SetWMF_Koeff - Load Data Timeout	restart the system
DSP/MSE:Hanning-Window Load Data Timeout	restart the system
DynContrast Out Of Range	Press ok and save this user-setting once again
End Bandwidth too big	restart the system, If after restart not ok then call technical support
End ET too big	restart the system, If after restart not ok then call technical support
End frequency too big	restart the system, If after restart not ok then call technical support
Enhance Out Of Range	Press ok and save this user-setting once again
Ensemble Out Of Range	Press ok and save this user-setting once again
Error in CreateCineImage	try to store again
Error not enough time for BC shot!	restart the system
Error on LoadBootMem Page:%2d, Addr:%5d	restart the system
Error programming Flashcomplette	restart the system
Error setting state	restart the system
ERROR_MSG_INIT_FAILED	Check connection from US machine to VCR, VCR has power and is on.
ERROR_MSG_NO_ACK	Check VCR cables and try again
ERROR_MSG_NO_CASSETTE	Put cassette into drive of VCR
ERROR_MSG_NO_RESPONSE	Check VCR cables, casette,... and try again
ERROR_MSG_WRITE_PROTECTED	Remove cassette from VCR and put writable cassette into drive of VCR.

Error Messages	Actions
Execute privileged instruction	restart the system
FallSmooth Out Of Range	Press ok and save this user-setting once again
File Could not CRC Check	Load volume files from other storage medium.
File CRC Error	Load volume files from other storage medium.
File CRC Missing	Load volume files from other storage medium.
File Data Missing	Load volume files from other storage medium.
File Datalength Not Consistent	Load volume files from other storage medium.
File Decompress Error	Load volume files from other storage medium.
File Decompress method Unknown	Load volume files from other storage medium.
File End Error	Load volume files from other storage medium.
File Execute Error	Load volume files from other storage medium.
File Memory Missing	Load volume files from other storage medium.
File Not Found	Load volume files from other storage medium.
File Not Found	Load another Backup from CD,…. (restart or reinstall the Application)
File Not Found	restart, install latest software version
File Pos	Load volume files from other storage medium.
File Read Error	Load volume files from other storage medium.
File Type Unknown	Load volume files from other storage medium.
File Volume size not consistent	Load volume files from other storage medium.
FLT: Denormal operand	restart the system
FLT: Divide by zero	restart the system
FLT: Invalid operation	restart the system
FLT: Stack overflow	restart the system
FLT: Underflow	restart the system
Hardware doesn't support CW-mode	pencil probe + CW-Hardware not available->HW problem
hardware error on	restart the system
HardwareRelatedSoftware_Windows in write have different ProbeAcousticUnitIDs	disconnect all connected probes and connect they anew, if not ok restart the system
HardwareRelatedSoftware_Windows in write have different ProbeScanFuncIDs	disconnect all connected probes and connect they anew, if not ok restart the system
lBegrenzer.cpp Bshots TxMultiFocus problem	restart the system
lBegrenzer.cpp Mshots TxMultiFocus problem	restart the system

Error Messages	Actions
In the 3D Image Measure is not allowed	Changed to another format than 3D Fullscreen mode
iSetVideoSource(eVideoIntern) function fails	reboot the system
iSetVideoSource(eVideoIntern) function fails	the system will restart itself by pressing OK
key not in list	restart the system
LP_KoefBlock: SamplePRF too big	restart the system
M_Gain Out Of Range	Press ok and save this user-setting once again
M_Reject Out Of Range	Press ok and save this user-setting once again
MC_BaseLinePos Out Of Range	Press ok and save this user-setting once again
MC_Gain Out Of Range	Press ok and save this user-setting once again
MC-TxPower Out Of Range	Press ok and save this user-setting once again
Memory access violation	restart the system
memory allocation error	restart the system, If after restart not ok then call technical support
Missing ProbeAcousticUnit, wrong ProbeAcousticUnitID.	restart the system
MotCtrl: No Referenzposition signal!	confirm the message by pressing the OK button, disconnect and connect the active probe and use it again, if again the message appears mostly the probe itself has an defect, so you should contact the service
MotCtrlDrv:bCmdToRS232	restart the system
M-TxPower Out Of Range	Press ok and save this user-setting once again
No CD Writer found	check the SCSI and the Power cable - plug the SCSI cable off and on and try again. (restart the system)
No disc in drive	insert disk, if fails again reboot and try again (with another disk)
No Line Memory!	restart the system
No Probe connected on left probe connector (A).	connect the probe
No Probe connected on left probe connector (B).	connect the probe
No Probe connected on left probe connector (C).	connect the probe
OCP connection failed\nPress OK and\nPlease switch POWER OFF and ON again...	Check the cables from the console, and restart (system must be switched off)
Old version of flashcomplete!\nFlashcomplete will be updated!\nPlease wait until confirm message appears!	execute it, restart the system
Overflow	restart the system
Persistence Out Of Range	Press ok and save this user-setting once again
Please plug off and on probe and try again	plug of and on the probe and try again, plug on a different probe connector.

Error Messages	Actions
PRF_GeneratorBoundary: BBC Ensemble Limitation out of limit	restart the system
PRF_GeneratorBoundary: BBCPW Ensemble Limitation out of limit	restart the system
Probe Scan Function Not Supplied	restart the system
Probe with Probe-ID %02X not supported…….	Disconnect and reconnect the probe
Probe-ID valid, but Flexible-EEPROM-Datamodel not implemented yet. On…….	Disconnect and reconnect the probe
PW_BaseLinePos Out Of Range	Press ok and save this user-setting once again
PW_BurstCalcBlock: UserProgApplication out of range	restart the system
PW_CW_FFT_FactBlock: DSC_ScrollX_Zoom darf nicht kleiner als eins sein!	restart the system
PW_Dynamic Out Of Range	Press ok and save this user-setting once again
PW_Reject Out Of Range	Press ok and save this user-setting once again
PWGain Out Of Range	Press ok and save this user-setting once again
PW-TxPower Out Of Range	Press ok and save this user-setting once again
RiseSmooth Out Of Range	Press ok and save this user-setting once again
Start Bandwidth too small	restart the system, If after restart not ok then call technical support
Start ET too small	restart the system, If after restart not ok then call technical support
Start frequency too small	restart the system, If after restart not ok then call technical support
System detected severe error, please call technical support.	restart, call technical support
System detected severe error. Some components like Touch Panel server may not be registered. Please register Touch Panel server and restart.	restart, call technical support
The Database corrupted, System try to repair.	database will be deleted, please load it new from backup
The Regesitery not closed	close registry, restart, try again
The Regesitery not closed	restart
The System Settings Database is Corrupted, All the data will be lost, Please load it from Backup	database will be deleted d:\UserSettings\SystemSettings.mdb, please load it new from backup
The User Programs Database is Corrupted, All the data will be lost, Please load it from Backup	database will be deleted, please load it new from backup
Thickness mismatch %d - GIP %d	restart 3D (go to 2D)
UI_BBC_Wnd:vSet() has an wrong ImageType	restart the system

Error Messages	Actions
UI_BBC_Wnd:vSet() will change from eB_Wnd to wrong ImageType	restart the system
UI_BBC_Wnd:vSet() will change from eBBC_Wnd to wrong ImageType	restart the system
UI_Manager:vHRS_Execute multiple call	restart the system
Unable to save...	restart the system, if the problem still exists call technical support
undefined CW ADC_Clk-Teiler	restart the system
Unhandled Probe-EEPROM data type on…….	Disconnect and reconnect the probe
unknown CPF_1 Xilinx-Version	restart the system
unknown CPF_2 Xilinx-Version	restart the system
unknown CPG1 Xilinx-Version	restart the system
unknown CPG2 Xilinx-Version	restart the system
unknown CPG3 Xilinx-Version	restart the system
Unknown Error	Load volume files from other storage medium.
unknown FMV Xilinx-Version	restart the system
unknown LMV Xilinx-Version	restart the system
unknown Xilinx-Version	restart the system
unknown XSYS Xilinx-Version	restart the system
unrecordable disc in drive	try again with another disk
VolAcqu3D4D_Enum has changes and isn't implemented in this block!	restart the system
Volume_dB Out Of Range	Press ok and save this user-setting once again
WMF_KoefBlock: SamplePRF too big	restart the system

Chapter 8
Replacement Procedures

Section 8-1
Overview

8-1-1 Purpose of Chapter 8

This chapter contains replacement procedures for different modules and their subsystems.

⚠ **WARNING** ***No covers or panels should be removed from the system (high-voltage risk). Service and repairs must only be performed by authorized personal. Attempting do-it-yourself repairs invalidate warranty and are an infringement to regulations and are inadmissible acc. to IEC 60601-1.***

Table 8-1 Chapter 8 Contents

Section	Description	Page Number
8-1	Overview	8-1
8-2	Backup Loading Procedure	8-2
8-3	EUM (Electronic User Manual) Upgrade Procedure	8-3
8-4	Replacement of the Trackball top fixation ring	8-8

8-1-2 Returning/Shipping Probes and Repair Parts

Equipment being returned must be clean and free of blood and other infectious substances.

GEMS policy states that body fluids must be properly removed from any part or equipment prior to shipment. GEMS employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstance should a part or equipment with visible body fluids be taken or shipped from a clinic or site (for example, body coils or and ultrasound probe).

The purpose of the regulation is to protect employees in the transportation industry, as well as the people who will receive or open this package.

The US Department of Transportation (DOT) has ruled that "items what were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care" are "regulated medical waste" for transportation purpose and must be transported as a hazardous material.

Section 8-2
Backup Loading Procedure

The Backup contains:

- User settings, Auto Text, Measurement user tables
- Biopsy (needle guide positions)
- Setup settings (language, date format, screensaver on/off, etc.)

8-2-1 Loading Procedure

see: Section 4-4-12-3 "Load System Presets and Configurations (Application Settings)" on page 4-28

Section 8-3
EUM (Electronic User Manual) Upgrade Procedure

NOTICE The Loading Procedure of the EUM (Electronic User Manual) differs at various software versions:
for Software Version up to 1.06F follow the instructions as described in Section on page 8-4
for Software Version from 1.06G follow the instructions as described in Section 8-3-2 on page 8-5

8-3-1 EUM - Upgrade Procedure (up to Software Version 1.06F)

1.) Restart the system (turn off and on the system).

NOTICE The electronic user manual (EUM) **must never** be opened (by pressing the F1 key on the keyboard) after last restart! Even if closed again before installing the new EUM.

2.) Press the UTILITIES key on the Touch Panel once to display the Utilities menu.
3.) Touch the SYSTEM SETUP key to invoke the setup desktop on the screen.
4.) Select the SERVICE page. The “Password window” appears automatically.
5.) Enter the password **SHE**, and click the ACCEPT key to get access to the Service Tools.
6.) The “Service Tools” menu appears on the screen.

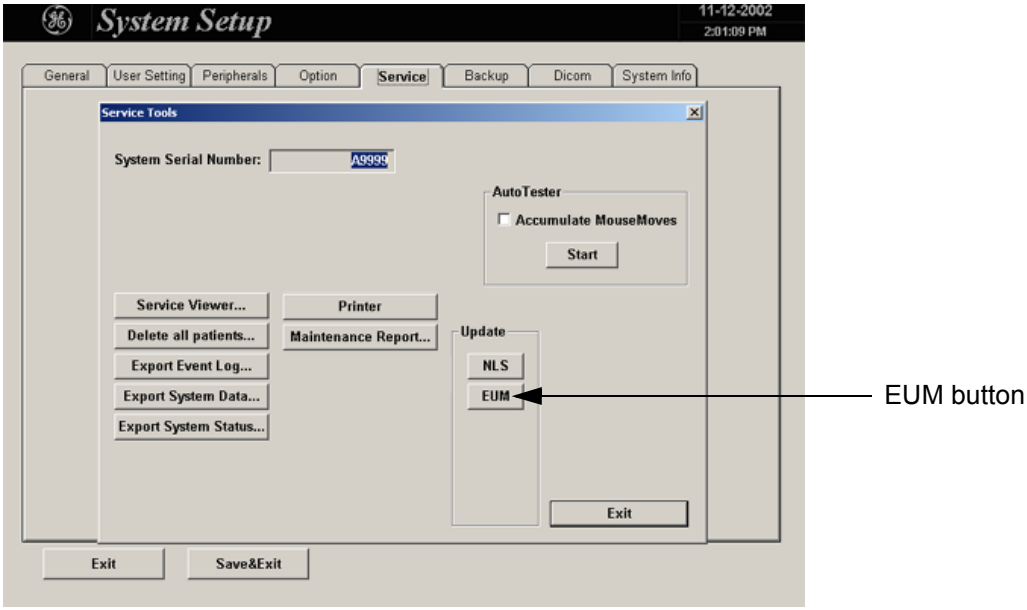


Figure 8-1 Service Tools

7.) Click the EUM button. The “Update Software” dialog appears.
8.) Select CD DRIVE. Browse for the **EUMSetup_en.exe** file in the **Install** folder and click OK.
9.) Confirm the following message with YES to proceed the update.
10.) The contents of this package are being extracted.
11.) Follow the instructions of the “InstallShield Wizard” (confirm the messages with the NEXT key).

8-3-1 EUM - Upgrade Procedure (up to Software Version 1.06F) (cont'd)

NOTE: Please select "Yes I want to restart my computer now", see: Figure 8-2.
(Otherwise the electronic user manual does not work till the next system start.)

12.) Remove any disks from their drives and click FINISH to complete the EUM installation. The system will reboot automatically.

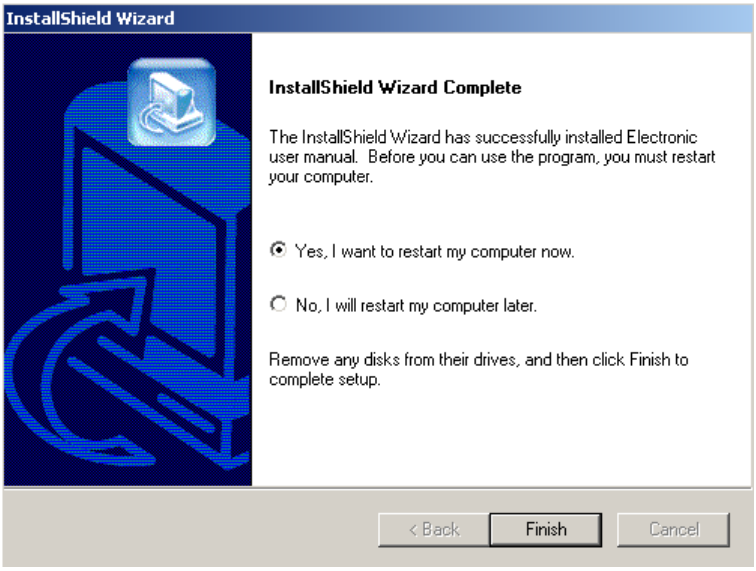

InstallShield Wizard
InstallShield Wizard Complete
The InstallShield Wizard has successfully installed Electronic user manual. Before you can use the program, you must restart your computer.
Yes, I want to restart my computer now.
No, I will restart my computer later.
Remove any disks from their drives, and then click Finish to complete setup.
< Back
Finish
Cancel

Figure 8-2 complete EUM installation

NOTE: If the "End Program" message box appears, select END NOW.

13.) After rebooting the system, fill in the requested information into the "System Status Messenger" box and click OK.

14.) Press the **F1** key on the keyboard to invoke the electronic user manual.

15.) Press the **ESC** key to exit the EUM.

8-3-2 EUM - Upgrade Procedure (from Software Version 1.06G)

8-3-2-1 EUM - Removal Procedure

1.) Restart the system (turn off and on the system).

NOTICE The electronic user manual (EUM) **must never** be opened (by pressing the F1 key on the keyboard) after last restart! Even if closed again before installing the new EUM.

2.) Touch the UTILITIES key on the Touch Panel once to display the Utilities menu.
3.) Touch the SYSTEM SETUP key to invoke the setup desktop on the screen.
4.) Select the SERVICE page, enter the password **SHE**, and click the ACCEPT button.

The “Service Tools” menu appears on the screen.

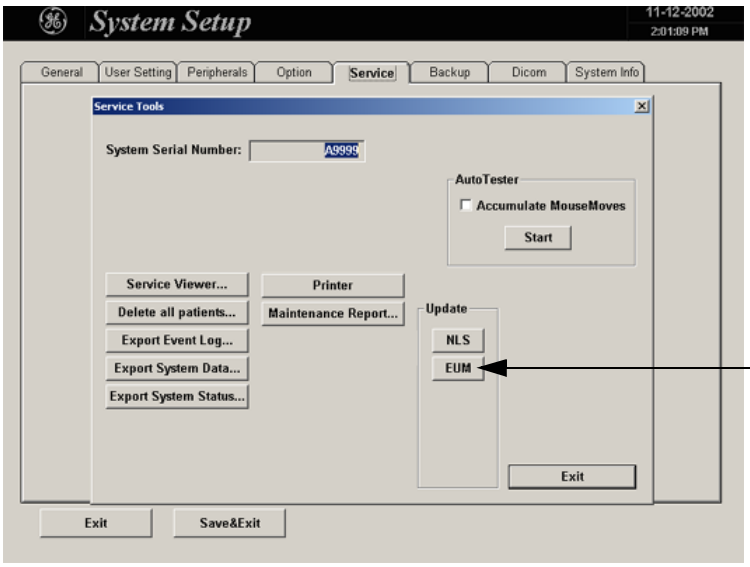


Figure 8-3 Service Tools

5.) Click the EUM button. The “Update Software” dialog appears.
6.) Select the MO DRIVE or the CD DRIVE button, depending on the storage medium you use.
7.) Browse for the **EUMSetup_en_xxxx.exe** file and click OK.

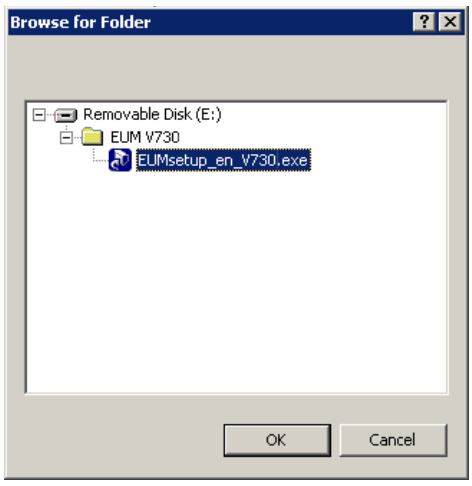


Figure 8-4 Browse for file

8-3-2-1 EUM - Removal Procedure (cont'd)

8.) Confirm the next message with YES to proceed the update.

The contents of the package are being extracted.

9.) Read the following warning message and confirm it with OK.

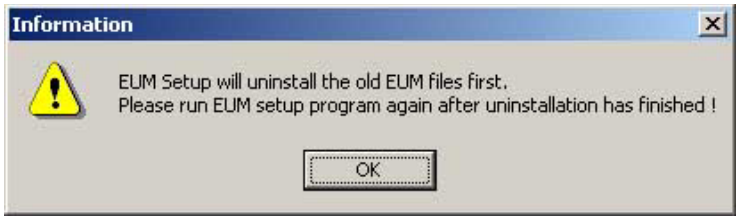

Information
EUM Setup will uninstall the old EUM files first.
Please run EUM setup program again after uninstallation has finished !
OK

Figure 8-5 confirm warning message

10.) Confirm the "Maintenance Complete" message: «InstallShield Wizard has finished performing maintenance operations on V730 User Manual» with the FINISH button..

NOTICE At this step the old EUM files will be uninstalled.

8-3-2-2 EUM - Installation Procedure

1.) Click the EUM button again to install new EUM.
2.) Select the MO DRIVE or the CD DRIVE button, depending on the storage medium you use.
3.) Browse for the **EUMSetup_en_xxxx.exe** file again and click OK.
4.) Confirm the following message with YES to proceed the update.

The contents of this package are being extracted.

5.) Follow the instructions of the “InstallShield Wizard” (confirm the messages with NEXT).
6.) After successfully installation of the Electronic User Manual, click FINISH to exit the wizard.

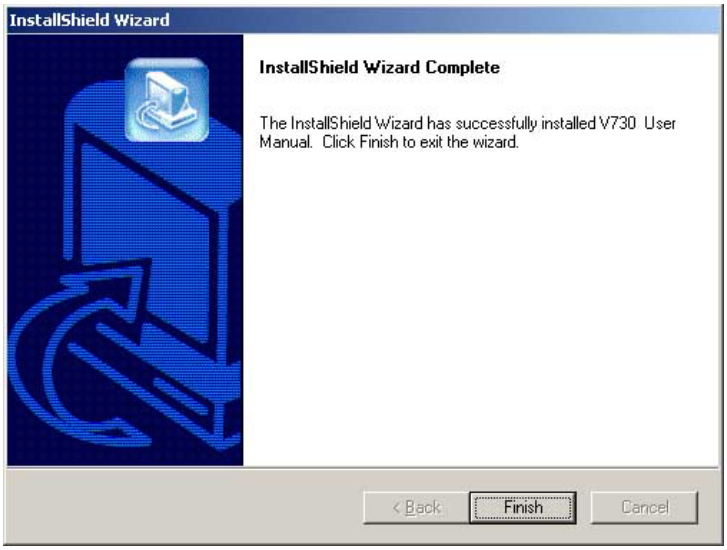

InstallShield Wizard
InstallShield Wizard Complete
The InstallShield Wizard has successfully installed V730 User Manual. Click Finish to exit the wizard.
< Back
Finish
Cancel

Figure 8-6 Complete EUM Installation

7.) Close the SERVICE page with EXIT and close the “System Setup” with SAVE & EXIT.
8.) Restart the system (turn off and on the system).
9.) After rebooting the system, fill in the requested information into the “System Status Messenger” box and click OK.
10.) Press the **F1** key on the keyboard to invoke the electronic user manual.
11.) Click on the [X] symbol at the upper right edge of the Help window to exit the EUM.

Section 8-4
Replacement of the Trackball top fixation ring

8-4-1 Manpower

One person, 5 min.

8-4-2 Trackball top fixation ring - Replacement Procedure

1.) Remove the fixation ring by turning it counterclockwise.

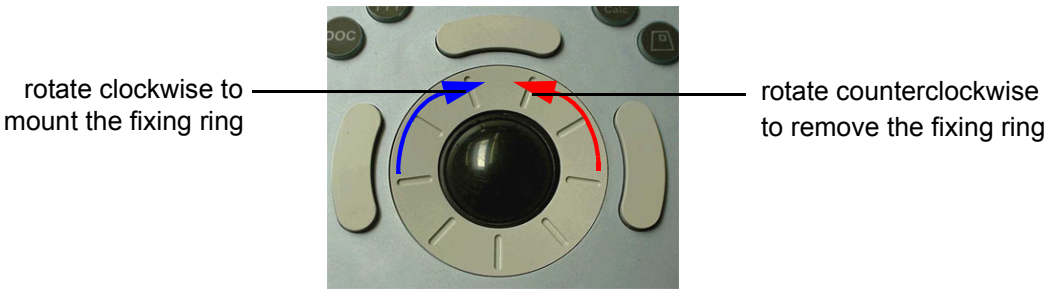


Figure 8-7 Trackball with top fixation ring

2.) Mount the fixation ring by turning it clockwise.

Chapter 9
Renewal Parts

Section 9-1
Overview

9-1-1 Purpose of Chapter 9

This chapter gives you an overview of Spare Parts available for the Voluson® 730.

Table 9-1 Contents in Chapter 9

Section	Description	Page Number
9-1	Overview	9-1
9-2	List of Abbreviations	9-2
9-3	Parts List Groups	9-3
9-4	Housing (GW) and additional Console Hardware	9-4
9-5	User Interface (GEU) + Monitor	9-6
9-6	Disk Drives (GEM)	9-9
9-7	Main Power Module (CPN)	9-10
9-8	Main Board Module (GEF)	9-11
9-9	Options and Upgrades	9-18
9-10	Miscellaneous Cables	9-19
9-11	Optional Peripherals and Accessories	9-25
9-12	Probes	9-29

Section 9-2
List of Abbreviations

- FRU 1 - Replacement part available in parts hub
- FRU 2 - Replacement part available from the manufacturer (lead time involved)
- GW - Trolley including Console and Monitor mounting plate (except GEU)
- GEU - User interface: Keyboard, Touch Screen, EL-Display, TGC Unit
- GEM - Disk Drive module (with or without MAN)
- CPN - Primary power module
- GEF - Main Board Module (Ultrasound (FrontEnd) and PC-Boards (Backend Processor))
- MAN - ECG module
- GES - I/O –Interface (User accessible)

Section 9-3
Parts List Groups

Figure 9-1 Console Views

Table 9-2 Mechanical and user accessible parts

Item	Part Group Name	Table Number	Description
100-	Housing (GW) and additional Console Hardware	Table 9-3 on page 5	GW -Trolley including Console and Monitor mounting plate (except GEU and GEM)
200-	User Interface (GEU) + Monitor	Table 9-4 on page 6	GEU - User interface: Keyboard, Touch Screen, EL-Display, TGC Unit + Monitor
300-	Disk Drives (GEM)	Table 9-6 on page 9	GEM - Disk Drive module (with or without MAN)
400-	Main Power Module (CPN)	Table 9-7 on page 10	CPN - Primary power module
500- 510- 520- 530- 570-	Main Board Module (GEF) • FrontEnd (US-Part) • FrontEnd (US-Part) cont´d • FrontEnd (US-Part) cont´d • BackEnd Processor (PC-Part)	Table 9-8 on page 11 Table 9-9 on page 12 Table 9-10 on page 14 Table 9-11 on page 15 Table 9-12 on page 17	GEF - Main Board Module Ultrasound (FrontEnd) and PC-Boards (BackEnd Processor)
600-	Options and Upgrades	Table 9-13 on page 18	
700-	Miscellaneous Cables	Table 9-14 on page 19	
800-	Optional Peripherals and Accessories • Optional Peripherals and Access. cont´d	Table 9-15 on page 26 Table 9-16 on page 27	Printers, Video Recorder, ECG-Module (MAN)
	System Manuals	Table 9-17 on page 28	
900- 906- 920- 930- 940-	Probes • 2D curved array Transducers • 2D linear- and phased array Transducers • Real-Time 4D Volume Probes • CW-Pencil Probes • Live 3D Probes	Table 9-18 on page 29 Table 9-19 on page 30 Table 9-20 on page 31 Table 9-21 on page 32 Table 9-22 on page 33	

Section 9-4
Housing (GW) and additional Console Hardware

Figure 9-2 Housing (GW) and additional Console Hardware

Table 9-3 Housing (GW) and additional Console Hardware

Item	Part Name	Part Number	Description	Qty	FRU
101	Rear Handle for Trolley	KTZ220031	Rear Handle for Trolley	1	1
102	Blind Cap for rear screws	KTZ208109	covers housing screws to make them invisible	1	1
103	Rear Metal Cover Plate (from A06150)	KTZ208739	Rear metal cover plate complete	1	2
104	Rear Metal Cover Plate (up to A06149)	KTZ220035	Rear metal cover plate	1	2
105	Side Panel left (from A06150)	KTZ208762	side panel left complete	1	2
106	Side Panel left (up to A06149)	KTZ220032	side panel left	1	2
107	Side Panel right (from A06150)	KTZ208763	side panel right complete	1	2
108	Side Panel right (up to A06149)	KTZ220033	side panel right	1	2
109	Door for Probe cables (from A06150)	KTZ208737	Through this door the side-panel-right can be opened to place the probe-cables within the housing of V730.	1	1
110	Door for Probe cables (up to A06149)	KTZ220034	Through this door the side-panel-right can be opened to place the probe-cables within the housing of V730.	1	1
111	Monitor Mounting Plate (from A05722)	KTZ207270	Monitor mounting plate incl. probe holder	1	1
112	Monitor Mounting Plate (up to A05721)	KTZ154604	Monitor mounting plate	1	1
113	Probe Holder (up to A05721)	KTZ13K815	Probe holder for Vaginal probe	1	1
114	Rear Wheel (Ø175 mm x 32)	KTZ211081	Rear wheel non-steerable	1	1
115	Blind Cap for Wheel	KTZ14M871	Cover for the rear wheels	1	1
116	Steerable Wheel	KTZ211080	Front wheel steerable	1	1
117	Foot rest (up to A05568)	KTZ154602	Foot rest	1	2
118	Foot rest (from A05569)	KTZ207126	Foot rest	1	1
119	GW83 Trolley V730	KTZ154628	Housing with wheels, monitor mounting plate, backpanel with connectors and cables	1	2
120	GES2 I/O Connection Panel	KTZ195503	External Rear Panel with electrical Signal- and Supply-Connection-Cables to the V730-Main-Unit (internal) Rear-Panel.	1	1
121	GES3 I/O Connection Panel	KTZ195638	External Rear Panel with electrical Signal- and Supply-Connection-Cables to the V730-Main-Unit (internal) Rear-Panel.	1	1
122	Hinges for Foot rest (from A05569)	KTZ220018	Hinges for Foot rest	2	1
123	Top Cover of Trolley	KTZ208092	Top Cover of Trolley	1	1
124	Top Cover of Trolley	KTZ208119	Top Cover of Trolley (can replace KTZ208092)	1	1
125	Stand By Switch	KTZ207125	Standby switch left below the control panel	1	1
126	Probe Cable Guide	KTZ14M787	routing for Probe cable	1	1

Section 9-5
User Interface (GEU) + Monitor

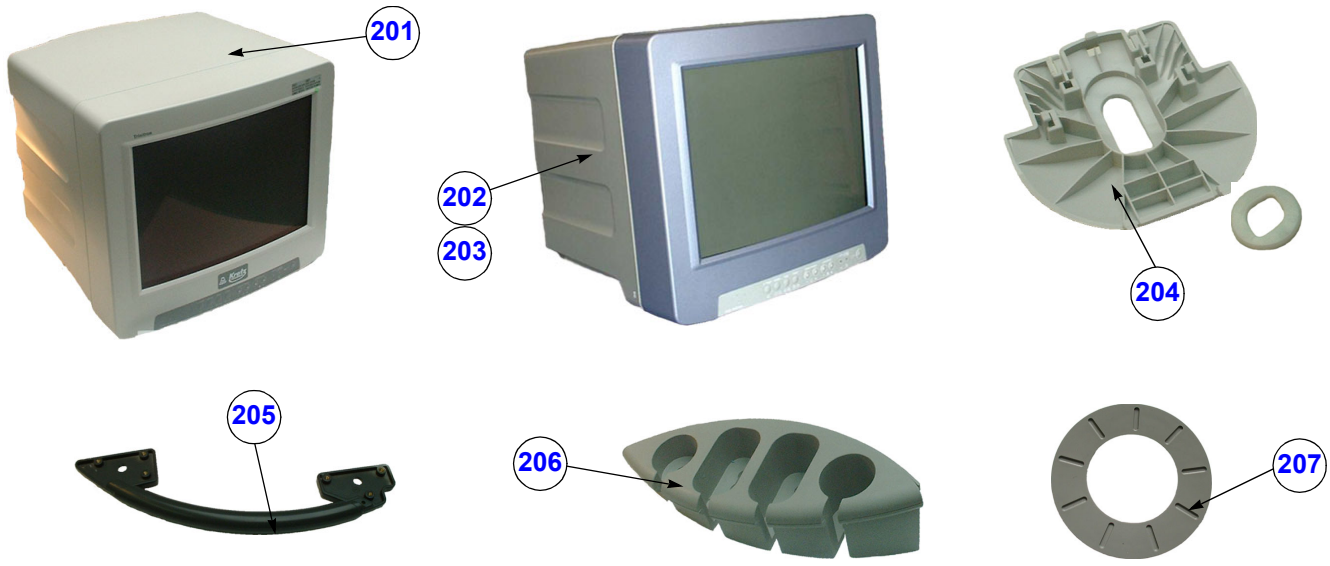


Figure 9-3 User Interface (GEU) + Monitor

Table 9-4 User Interface (GEU) + Monitor

Item	Part Name	Part Number	Description	Qty	FRU
201	Color Monitor 15” Light colored	KTZ211001	Reserved for V530D (Please order KTZ211096)	1	1
202	Color Monitor 15” Painted	KTZ211096	Sony PGM-100P1MD KR; lacquered	1	1
203	Color Monitor 15” Painted	KTZ211212	Sony PGM-100P1MD KR; lacquered (slightly different color shade - can replace KTZ211096)	1	1
204	Monitor mount Shell	KTZ208509	fixing part for Sony Monitor	1	1
205	Front Handle User Interface	KTZ220039	V730 Front Handle	1	1
206	Probe Holder Kit V730	KTZ207105	right hand Probe holder part	1	1
207	Trackball top fixation ring	KTZ208256	Trackball for top fixation ring	1	1

Section 9-5 User Interface (GEU) + Monitor (cont'd)

Figure 9-4 User Interface (GEU) + Monitor (cont´d)

Table 9-5 User Interface (GEU) + Monitor (cont´d)

Item	Part Name	Part Number	Description	Qty	FRU
207	Top Housing Kit V730	KTZ207102	upper plastic part of User Interface housing (GEU) including Push-buttons and Switches	1	1
208	Touchscreen, Display + Board Kit	KTZ207111	Electronic part of User Interface. This is the free programmable Part of V730-User Interface.	1	1
209	Trackball Kit V730	KTZ207099	generates X-Y-Coordinates of Trackball-Movements like moving a PC-Mouse	1	1
210	Trackball Kit V730	KTZ208264	generates X-Y-Coordinates of Trackball-Movements like moving a PC-Mouse	1	1
211	GEU4-6 Operator keys kit	KTZ207103	GEU4-6 Operator keys kit (incl. Shift Potentiometer knobs and digipots and toggle switch paddles)	1	1
212	GEU4-6 PC-Keyboard kit	KTZ207115	GEU4-6 PC-alphanumeric Keyboard kit	1	1
213	Left PWB kit for V730	KTZ207108	Printed Wire Board inside GEU	1	1
214	Right PWB kit for V730	KTZ207109	Printed Wire Board inside GEU	1	1
215	Slide Potentiometer kit for V730	KTZ207110	TGC Slider controls - board inside GEU	1	1
216	GEU1-2 User Interface AID without PS II	KTZ154621	keyboard, trackball, display, special knobs, switches (used in serial production up to # A05569)	1	2
217	GEU4-4b User Interface AID with PS II	KTZ154606	keyboard, trackball, display, special knobs, switches replaces GEU1-2 (used in serial production # A05570 - A06033)	1	1
218	GEU5-5b User Interface AID with PS II	KTZ154640	keyboard, trackball, display, special knobs, switches replaces GEU4-4b (used in serial production # A06034 - A06312)	1	1
219	GEU6 User Interface AID & PS II	KTZ154660	keyboard, trackball, display, special knobs, switches replaces GEU5-5b (used in serial production from # A06313 -)	1	1
220	Bottom Housing kit of GEU	KTZ207104	Bottom Housing kit of GEU	1	1
221	Distance Rod on GEU	KTZ208082	Distance Rod on GEU	1	1

Section 9-6
Disk Drives (GEM)

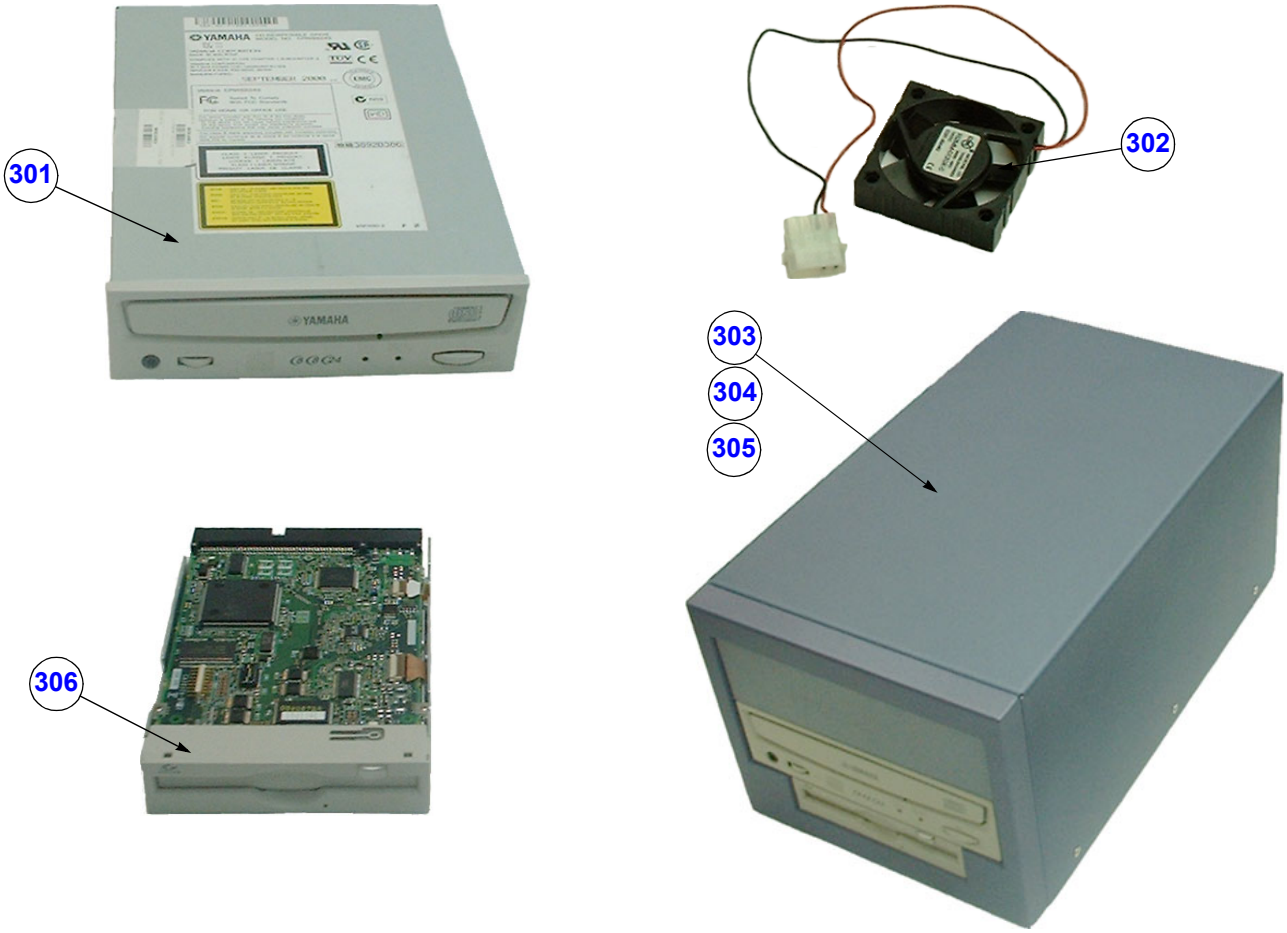


Figure 9-5 Disk Drives (GEM)

Table 9-6 Disk Drives (GEM)

Item	Part Name	Part Number	Description	Qty	FRU
301	CD/RW-Drive	KTZ207047	Standard CD-ROM-Burner internal (no own cabinet)	1	1
302	Fan axial 62 x 62 x 14 mm	KTZ207602	Fan for Air-Cooling of GEM (SCSI-Drive-Module)	1	1
303	GEM1-1a SCSI Disk Drive Module	KTZ195474	Mechanical Module for SCSI-Drives MO and CD/RW (used in serial production up to # A06310)	1	2
304	GEM2 MO-Drive + CR/RW	KTZ154652	Mechanical Module for SCSI-Drives MO and CD/RW replaces GEM1-1a (used in serial production from # A06311 -)	1	2
305	GEM3-3a MO-Drive + CR/RW	KTZ154673	Mechanical Module for SCSI-Drives MO and CD/RW replaces GEM1-1a and GEM2 (not used in serial production)	1	2
306	MO-Drive SCSI 1.3 GB internal	KTZ207050	Standard Magneto-Optical-Drive SCSI 1.3GB internal (has no own cabinet)	1	1

Section 9-7
Main Power Module (CPN)

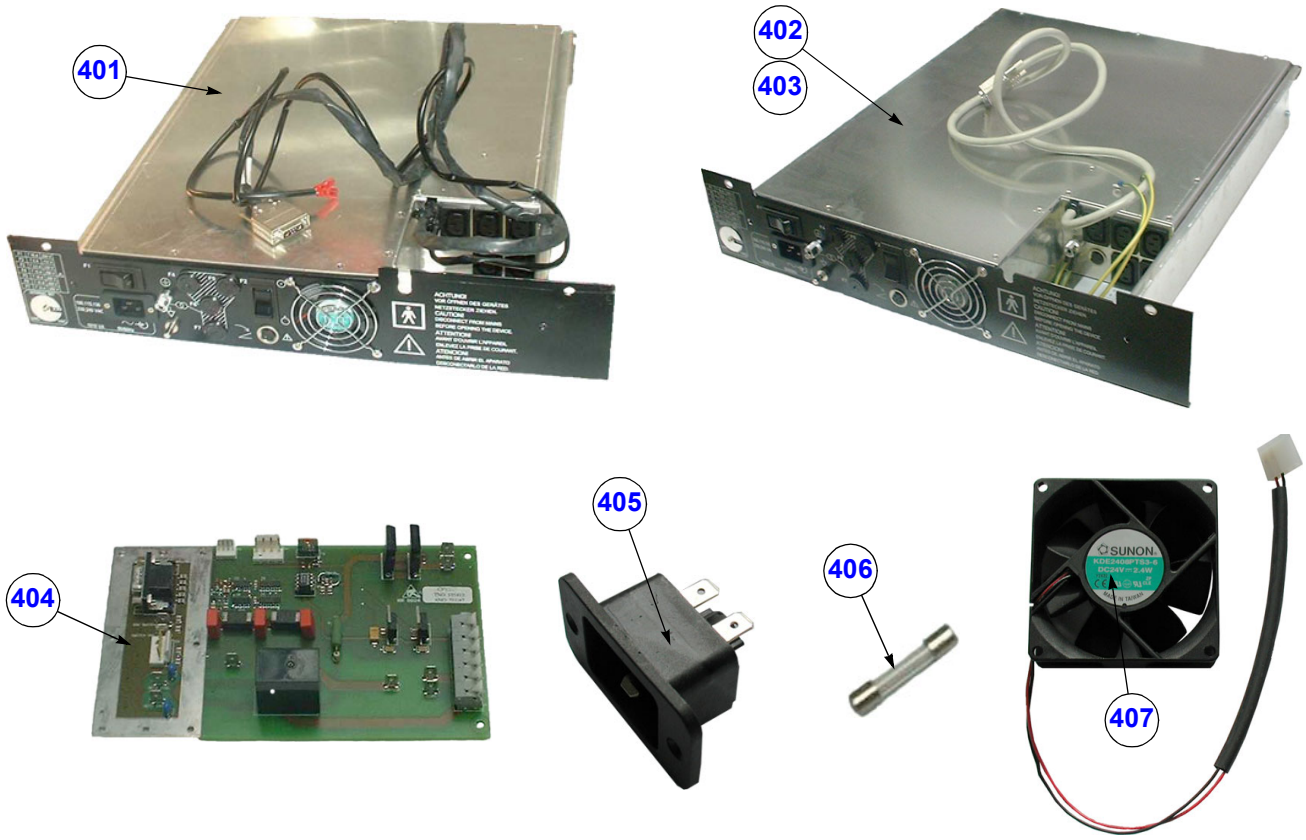


Figure 9-6 Main Power Module (CPN)

Table 9-7 Main Power Module (CPN)

Item	Part Name	Part Number	Description	Qty	FRU
401	CPN3 Primary Power Supply Module	KTZ195510	CPN3-3a Primary Power Supply Module (used in serial production up to # A05800)	1	1
402	CPN4 Power Supply Module	KTZ195564	CPN4-4 Power Supply Module replaces CPN3 (used in serial production from # A05801 - A06353)	1	1
403	CPN5 Power Supply Module	KTZ195739	CPN5 Power Supply Module replaces CPN4 (used in serial production from # A06354 -)	1	1
404	CPY3.P3 Power Switch	KTZ195471	Board to switch on and shut down Ultrasound System	1	1
405	Mains Power Input connector	KTZ207574	Mains Power Input connector	1	1
406	Fuse 10 Ampere 6.3 x 32	KTZ208239	Electric Current Overflow Protection GEF	4	1
407	KVN2 - Fan for Primary Power Supply	KTZ195440	KVN2 - Fan for Primary Power Supply (CPN)	1	1

Section 9-8
Main Board Module (GEF)

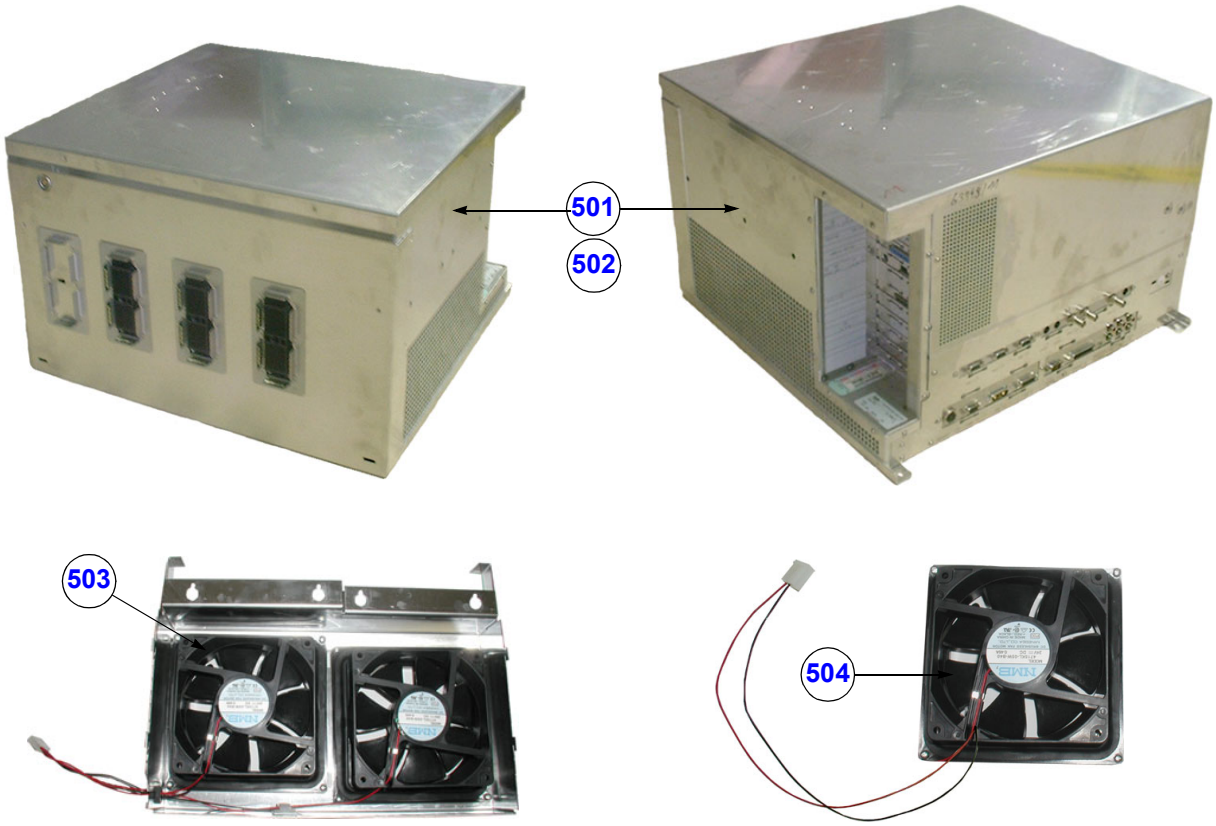


Figure 9-7 Main Board Module (GEF)

Table 9-8 Main Board Module (GEF)

Item	Part Name	Part Number	Description	Qty	FRU
501	GEF1-2d Main Board Chassis	KTZ195400	GEF1-2d Chassis mech.+ electr. (Main Board) (used in serial production up to # A06353)	1	N
502	GEF3 Main Board Chassis	KTZ195700	GEF3 Chassis mech. + electr. (Main Board) can replace GEF1-2d (used in serial production from # A06354 -)	1	N
503	Fan for GEF-box (2 fan)	KTZ154678	Fan for GEF-box (2 fan)	1	1
504	Fan for GEF-box (single)	KTZ154679	Fan for GEF-box (single)	1	1

9-8-1 FrontEnd (US-Part)

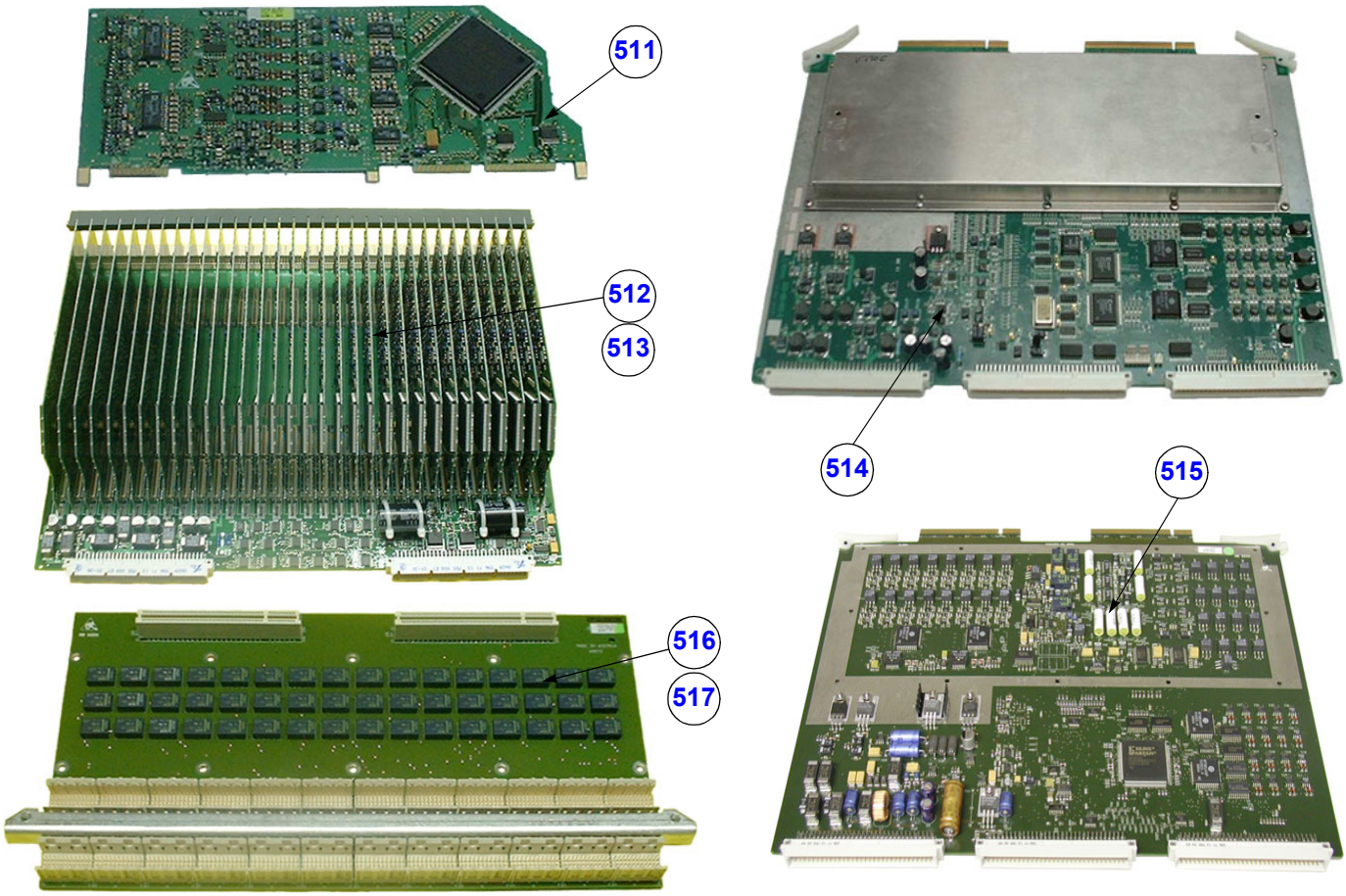


Figure 9-8 FrontEnd (US-Part)

Table 9-9 FrontEnd (US-Part)

Item	Part Name	Part Number	Description	Qty	FRU
511	CPD3-3a.P3 Beamformer SUB-Board	KTZ195375	Sub-board on CPR	1	1
512	CPR4-4b.P4 Beamformer Board (up to A06353)	KTZ195462	Beamformer Board (can not be replaced by CPR51.P6)	1	1
513	CPR51.P6 Beamformer Board (from A06354)	KTZ195645	Beamformer Board (can not be replaced by CPR4-4b.P4)	1	1
514	CWD2 CW Doppler Board	KTZ195663	CW-Doppler Board	1	1
515	CRW2.P2 CW Doppler Board	KTZ195723	CW-Doppler Board (can replace CWD2), minimum software requirement 1.06	1	1
516	CPZ2-2a.P2 Cover board (up to A06353)	KTZ195406	electrical signal connection between CPU,CPR and CW-Board; contains Relays for Signal to CW-Board (can not be replaced by CPZ50-50a.P3)	1	1
517	CPZ50-50a.P3 Cover board (from A06354)	KTZ195592	electrical signal connection between CPU,CPR and CW-Board; contains Relays for Signal to CW-Board. (can not be replaced by CPZ2-2a.P2)	1	1

9-8-1 FrontEnd (US-Part) (cont'd)

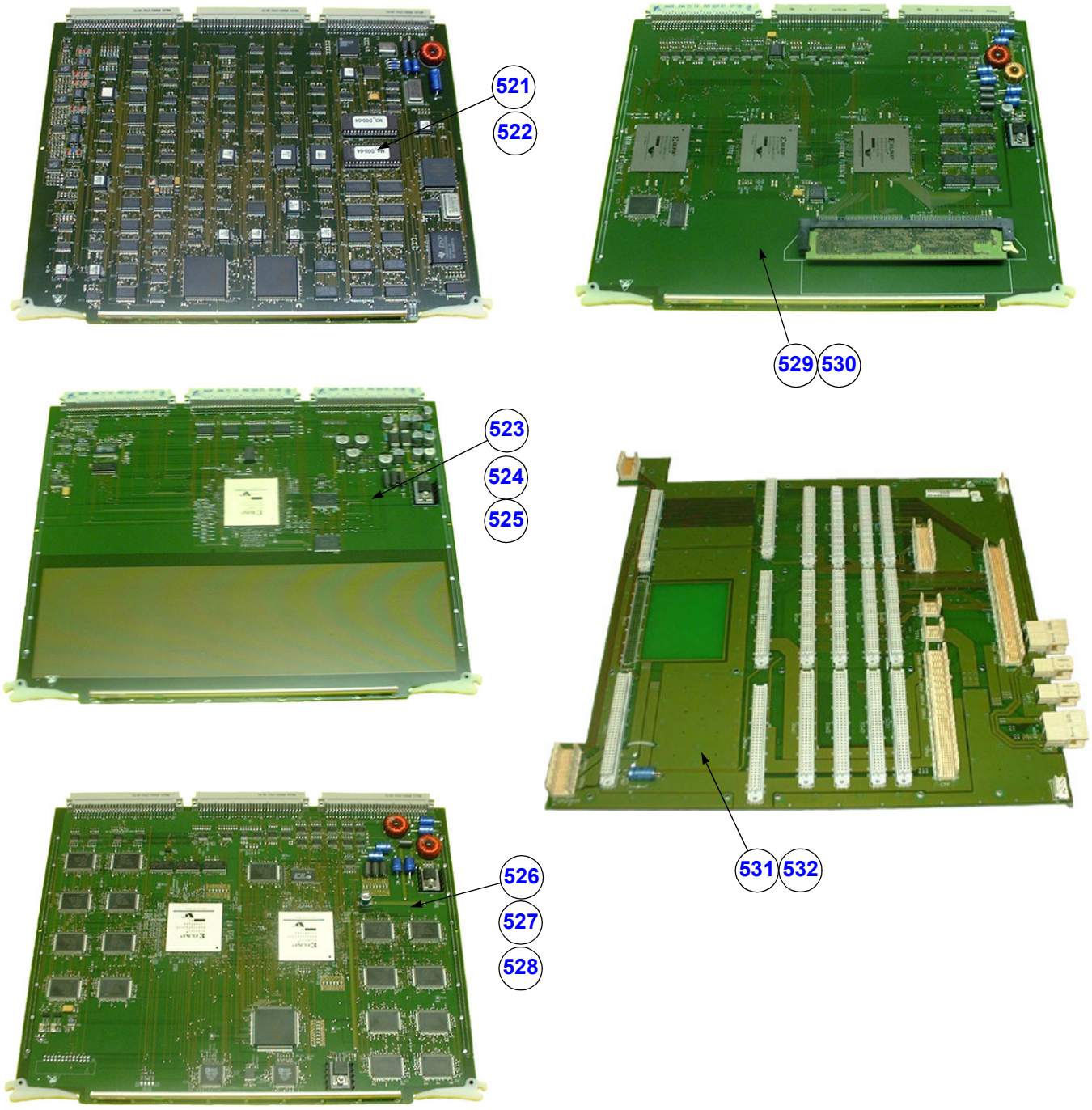


Figure 9-9 FrontEnd (US-Part) cont´d

Table 9-10 FrontEnd (US-Part) cont´d

Item	Part Name	Part Number	Description	Qty	FRU
521	CCM50.P7 Motor Control Board	KTZ195497	Motor Control Board	1	1
522	CCM55.P9 Motor Control Board	KTZ195788	Motor Control Board can replace CCM50.P7	1	1
523	CPC2-2f.P2 System Control Board (up to A06104) ***	KTZ195324	System Control Board (can not be replaced by CPC4.P4 and CPC5, except ***)	1	1
524	CPC4.P4 System Control Board (from A06105 -)	KTZ195654	System Control Board (can not be replaced by CPC2-2f.P2)	1	1
525	CPC5.P4 System Contorl Board (from Ap6105 -)	KTZ195821	System Control Board (can replace CPC4.P4 ; can not replace CPC2-2f.P2)	1	1
526	CPF3-3a.P3 Color Doppler Board (up to A06104) ***	KTZ195439	Color Doppler Board (can not be replaced by CPF10-10a.P4 and CPF11.P5, except ***)	1	1
527	CPF10-10a.P4 Color Doppler Board (from A06105)	KTZ195597	Color Doppler Board (can not be replaced by CPF3-3a.P3)	1	1
528	CPF11.P5 Color Doppler Board	KTZ195750	Color Doppler Board (can replaced CPF10-10a.P4 ; but not CPF3-3a.P3)	1	1
529	CPG3-3c.P3 Mid-Processor Board (up to A06104) ***	KTZ195414	Mid-Processor Board (Frame Filter, Mixer, HF-Filter, Log.Demodulator) (can not be replaced by CPG4.P3, except ***)	1	1
530	CPG4.P3 Mid-Processor Board (from A06105)	KTZ195594	Mid-Processor Board (Frame Filter, Mixer, HF-Filter, Log.Demodulator) (can not be replaced by CPG3-3c.P3)	1	1
531	CPK3.P3 Motherboard V730	KTZ195466	Electrical Signal- and Supply-Connection for all boards including PC-Motherboard (CPM)	1	1
532	CPK4.P3 Motherboard V730	KTZ195822	Electrical Signal- and Supply-Connection for all boards including PC-Motherboard (CPM) can replace CPK3.P3	1	1

CAUTION

***** For Voluson® 730 system with serial numbers listed below use CPC4; or CPF10; or CPG4!!!**

A05540, A05547, A05589, A05667, A05668, A05669, A05670, A05675, A05676, A05677, A05705, A05748, A05789, A05978, A05984, A05990, A06058, A06064, A06065, A06070, 1509KR9(A06075), 1492KR0(A06076), 1477KR9(A06077), 1502KR4(A06078), 1503KR2(A06079), 750KR0(A06080), 1481KR1(A06081), 748KR4(A06082), 1479KR5(A06084), 1497KR7(A06085), 756KR7(A06086), 1507KR3(A06087), 1490KR2(A06088), 749KR2(A06089), 1488KR6(A06090), 1498KR5(A06091), 1476KR1(A06092), 1485KR2(A06093), 1510KR7(A06094), 753KR4(A06095), 1513KR1(A06096), 1501KR6(A06097), 752KR6(A06098), 1500KR8(A06099), 1474KR6(A06100), 1471KR2(A06101), 1486KR0(A06102), 1505KR7(A06104)

9-8-1 FrontEnd (US-Part) (cont'd)

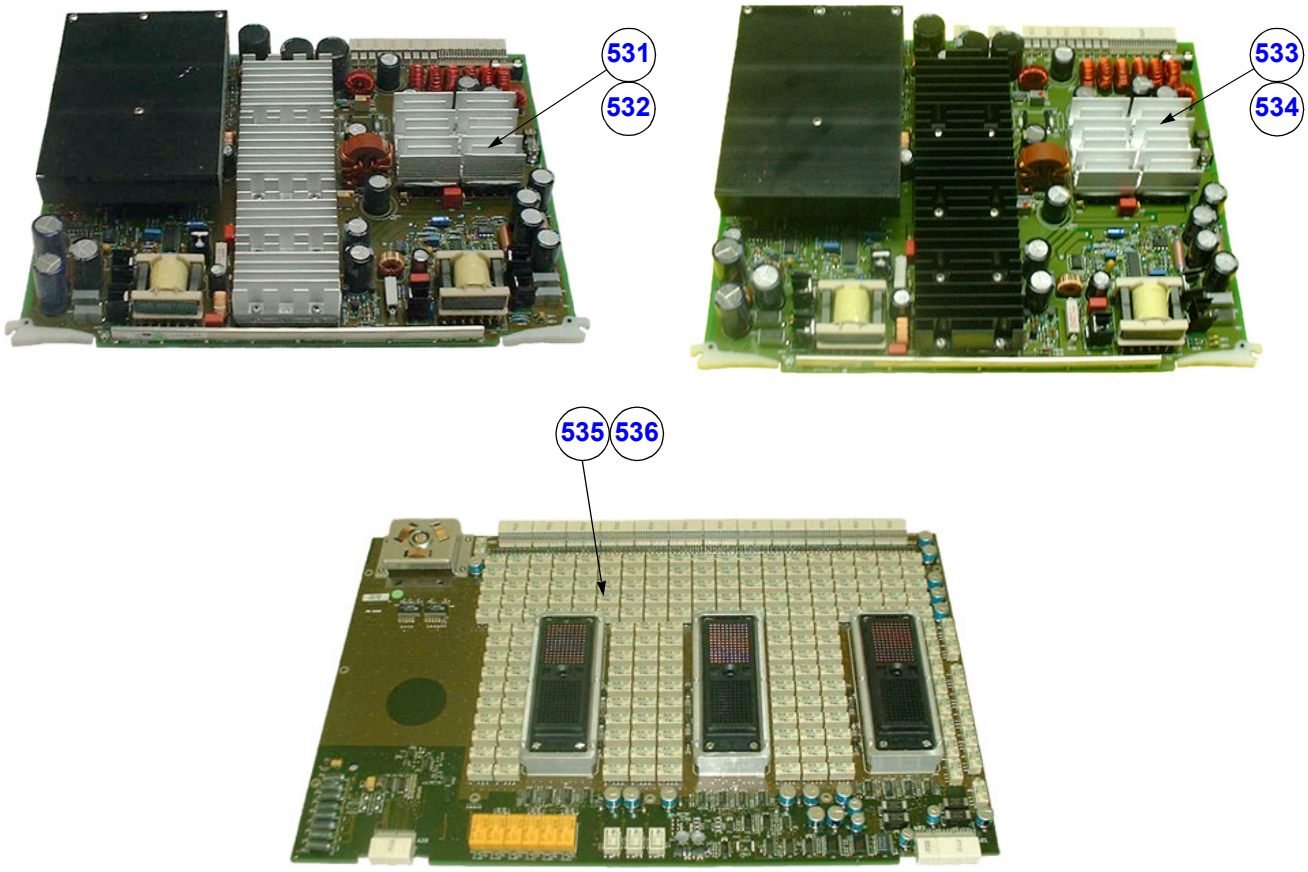


Figure 9-10 FrontEnd (US-Part) cont´d

Table 9-11 FrontEnd (US-Part) cont´d

Item	Part Name	Part Number	Description	Qty	FRU
531	CPP2-2e.P2 Power Supply Board	KTZ195353	Power Supply Board Output Power: 900W	1	1
532	CPP3-3c.P3 Power Supply Board	KTZ195515	Power Supply Board Output Power: 900 W (can replace CPP2-2e.P2)	1	1
533	CPP4-4b.P3 Power Supply Board	KTZ195679	Power Supply Board Output Power: 900 W (can replace CPP2-2e.P2 and CPP3-3c.P3)	1	1
534	CPP5.P3 Power Supply Board	KTZ195826	Power Supply Board Output Power: 900 W (can replace CPP2-2e.P2, CPP3-3c.P3 + CPP4-4b.P3)	1	1
535	CPU1-1d.P1 Probe Connector Board (up to A06353)	KTZ195417	Probe Connector Board, Module Board (CW connector not fitted) (used in serial production up to # A06353) (can not be replaced by CPU5.P5)	1	1
536	CPU5.P5 Module Board (BYM) (from A06354)	KTZ195636	Probe Connector Board, Module Board (used in serial production from # A06354 -) (can not be replaced by CPU1-1d.P1)	1	1

9-8-2 BackEnd Processor (PC-Part)

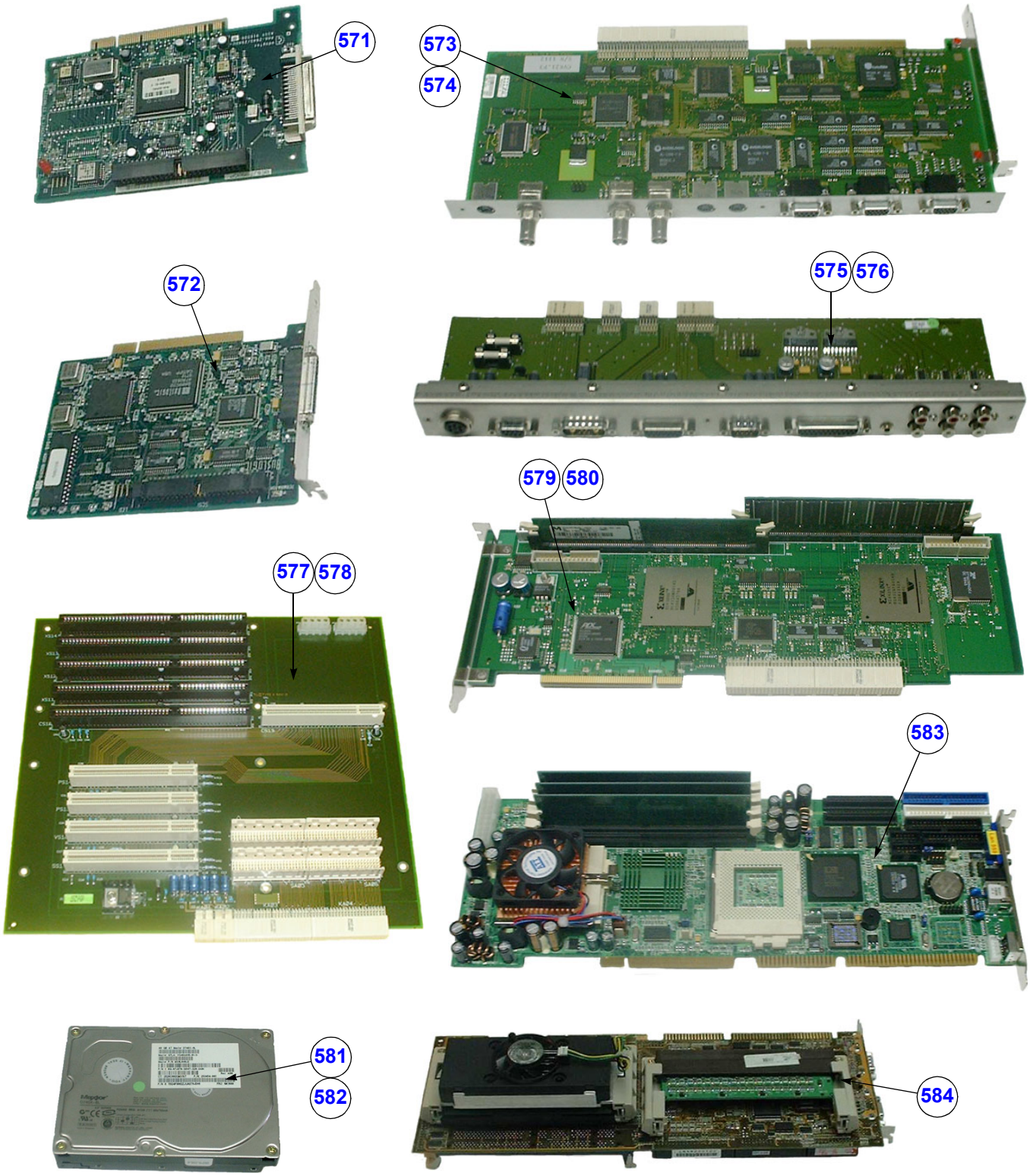


Figure 9-11 BackEnd Processor (PC-Part)

Table 9-12 BackEnd Processor (PC-Part)

Item	Part Name	Part Number	Description	Qty	FRU
571	AHA-2940U SCSI-II-Control Board	KTZ207402	SCSI-II Control Board	1	1
572	BT948 (SCSI-Controller Board)	KTZ207973	SCSI Controller Board	1	1
573	CKV20.P2-21a.P3 Video manager Board	KTZ207034	PC-Video converter Board	1	1
574	CKV22.P3 Video manager Board	KTZ207593	PC-Video converter Board (can replace CKV20 if SW 1.06G is installed)	1	1
575	CPE3.P3 Motherboard - Extension	KTZ195463	Motherboard Extension (used in serial production up to # A06040)	1	1
576	CPE4.-4a.P4 Motherboard - Extension	KTZ195542	Motherboard Extension (used in serial production from # A06041 -) can replace CPE3.P3	1	1
577	CPM2.P2 Motherboard (up to A06104) ***	KTZ195191	electrical Signal- and Supply-Connection between all PC-Plug-In-Boards (can not be replaced by CPM3.P2, except ***)	1	1
578	CPM3.P2 Motherboard (from A06105)	KTZ195699	electrical Signal- and Supply-Connection between all PC-Plug-In-Boards (can not be replaced by CPM2.P2)	1	1
579	CPS3-3a.P3 Scan converter Board (up to A06104) ***	KTZ195415	Scan converter Board (can not be replaced by CPS4.P3, except ***)	1	1
580	CPS4.P3 Scan converter Board (from A06105)	KTZ195596	Scan converter Board (can not be replaced by CPS3-3a.P3)	1	1
581	Harddisk (Systems with 850 MHz PC) (up to A06267)	KTZ207625	Harddisk IDE (used in serial production up to # A06267) (can not be replaced by HDD 1GHz)	1	1
582	Harddisk (Systems with 1 GHz PC) (from A06268)	KTZ208799	Harddisk IDE (used in serial production from # A06268) (can not be replaced by HDD 850MHz)	1	1
583	SBC- Single Board Computer PIII 133 MHz FSB (1GHz) ; (from A06268)	KTZ207389	Standard Single Board-PC, Pentium-III, 1GHZ, 133MHz-FrontSideBus, PCI-Bus, 768MB Ram, (used in serial production from # A06268)	1	1
584	SBC-Single Board Computer PII/PIII (850MHz) ; (up to A06267)	KTZ207666	Standard Single Board Computer (used in serial production up to # A06267) can be replaced by PC-kit KTZ195718	1	1

CAUTION

***** For Voluson® 730 system with serial numbers listed below use CPM3; or CPS4!!!**

A05540, A05547, A05589, A05667, A05668, A05669, A05670, A05675, A05676, A05677, A05705, A05748, A05789, A05978, A05984, A05990, A06058, A06064, A06065, A06070, 1509KR9(A06075), 1492KR0(A06076), 1477KR9(A06077), 1502KR4(A06078), 1503KR2(A06079), 750KR0(A06080), 1481KR1(A06081), 748KR4(A06082), 1479KR5(A06084), 1497KR7(A06085), 756KR7(A06086), 1507KR3(A06087), 1490KR2(A06088), 749KR2(A06089), 1488KR6(A06090), 1498KR5(A06091), 1476KR1(A06092), 1485KR2(A06093), 1510KR7(A06094), 753KR4(A06095), 1513KR1(A06096), 1501KR6(A06097), 752KR6(A06098), 1500KR8(A06099), 1474KR6(A06100), 1471KR2(A06101), 1486KR0(A06102), 1505KR7(A06104)

Section 9-9
Options and Upgrades

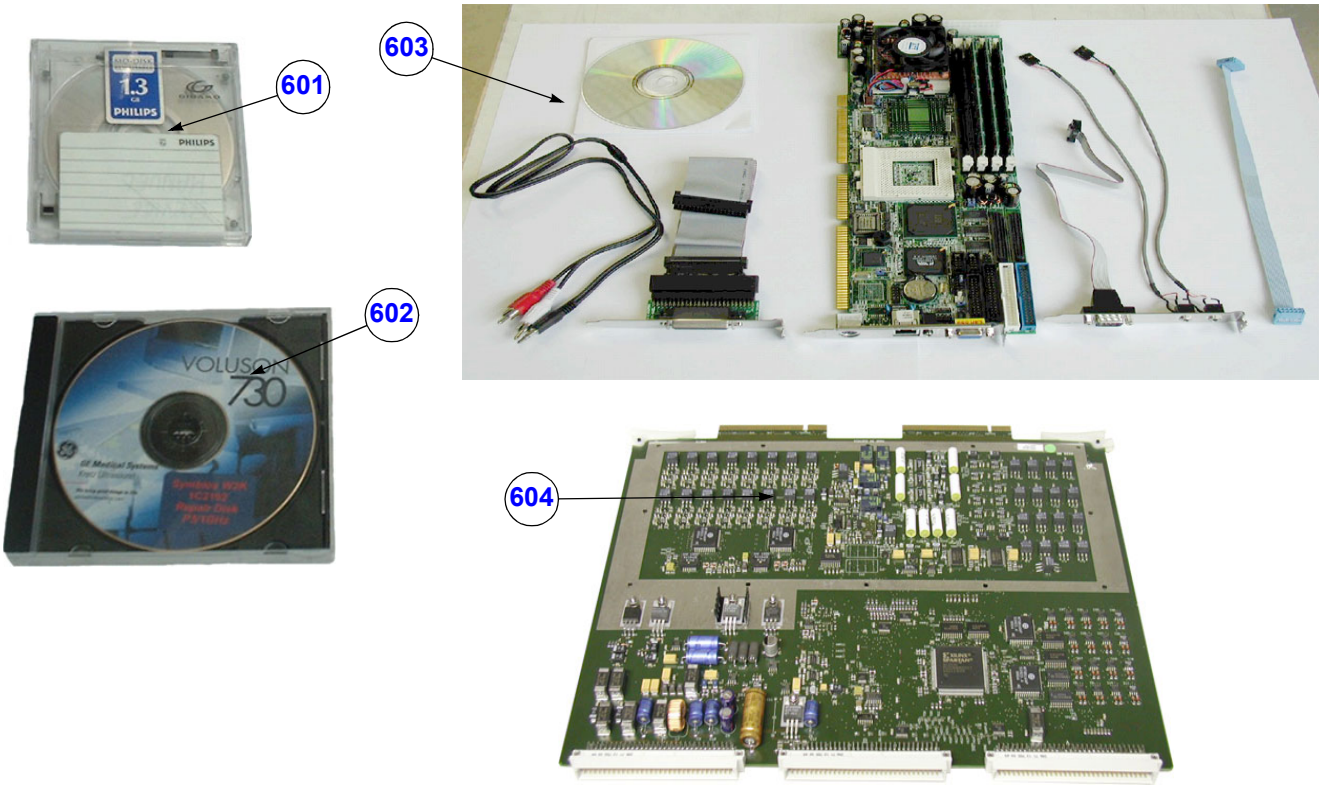


Figure 9-12 Options and Upgrades

Table 9-13 Options and Upgrades

Item	Part Name	Part Number	Description	Qty	FRU
601	MO Disk Media 1.3GB	KTZ207077	MO-Disk Media (Standard)	1	1
602	Service Boot CD-Rom PIII/ 1GHz	KTZ1C2192	Repair CD-Rom (Linux based); only for 1GHZ SBC-boards which have no GE licensed BIOS (	1	1
603	PC-Replace Kit PIII/ 1GHz (up to A06267)	KTZ195718	PC Board - replacement for 850MHz	1	1
604	PCW1-1a CW Upgrade Kit (from A05900)	KTZ195615	CW-Doppler Upgrade Kit	1	1

Section 9-10
Miscellaneous Cables

Table 9-14 Miscellaneous Cables

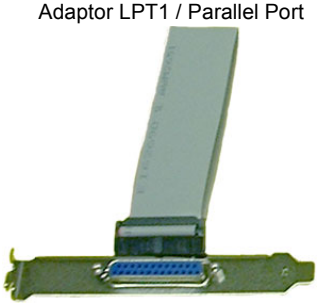
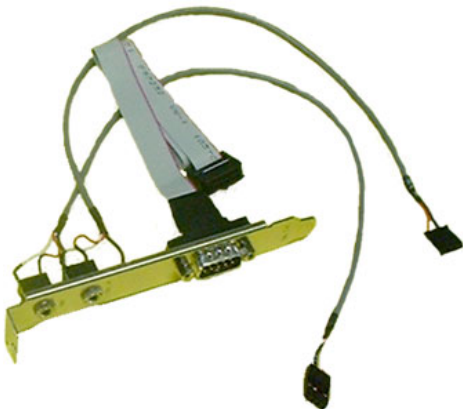
Item	Part Name	Part Number	Description	Qty	FRU
701	Adapter SCSI-II DB50/DB50	KTZ207121	SCSI-Link	1	1
702	Adaptor 26Pin / SUB-D25	KTZ207085	Adaptor LPT1 / Parallel Port 	1	1
703	Adapter Line in MIC; GEU	KTZ207390	Serial - MIC in - Speaker out 	1	1
704	Cable 50Pin SCSI-2 Data Cable 1.8m	KTZ212403	Data Transfer between PC and SCSI-Module	1	1

Table 9-14 Miscellaneous Cables

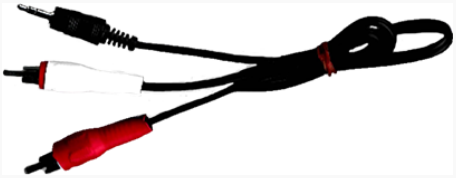
Item	Part Name	Part Number	Description	Qty	FRU
705	Cable HDD Y-Power	KTZ212426	12V/5V-Power Supply-Distributor-Cable (2x) for PC-Component (yellow-black, red-black)	1	1
706	Cable Stereo Jack - Chinch	KTZ212074	Cable from PC-Sound-StereoJack to External Rear Panel 	1	1
707	Data Cable HDD	KTZ212398	Data cable for IDE-Harddisk 40pin 330mm	1	1
708	GES2 I/O Connection Panel	KTZ195503	External Rear Panel with electrical Signal- and Supply-Connection-Cables to the V730-Main-Unit (internal) Rear-Panel.	1	1
709	GES3 I/O Connection Panel	KTZ195638	External Rear Panel with electrical Signal- and Supply-Connection-Cables to the V730-Main-Unit (internal) Rear-Panel.	1	1
710	KGS10 Cable Power GEM-GEF	KTZ195464	Electrical Power-Supply for SCSI-Drives (5V/12V)	1	1

Table 9-14 Miscellaneous Cables

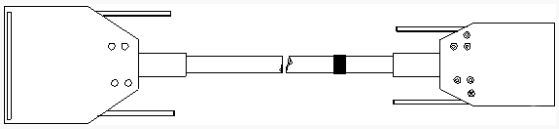
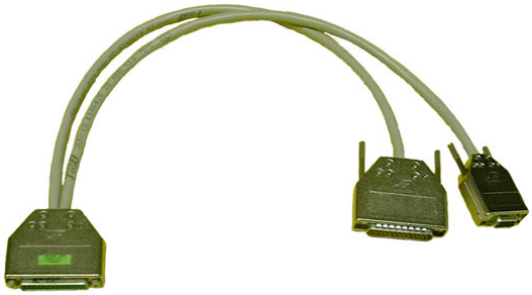
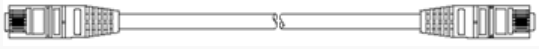
Item	Part Name	Part Number	Description	Qty	FRU
711	KUG5 Remote Cable	KTZ195606	VCR -Remote Control Cable 	1	1
712	KUR10 Cable Data SCSI	KTZ195473	internal Data Cable between SCSI-Module-Connector and SCSI-Drives (CD-Rom, MO-Drive)	1	1
713	KVR1 TERM-RS232PC / V730, Y-Cable	KTZ195416	electrical Signal- and Supply-Connection between V730 and User Interface GEU 	1	1
714	KVR2 TERM-RS232PC / V730, Y-Cable	KTZ207353	electrical Signal- and Supply-Connection between Voluson® 730 and User Interface GEU (can replace KVR1 cable - KTZ195416)	1	1
715	KVS2 Cable Serial Interface	KTZ195717	electrical-Signal-Connection between CPS and PIC_MG-Slot-CPU	1	1
716	KVX1 Network Cable	KTZ212016	Cable from external rear Panel to the V730-Main-Unit (internal) rear-Panel 1m 	1	1

Table 9-14 Miscellaneous Cables

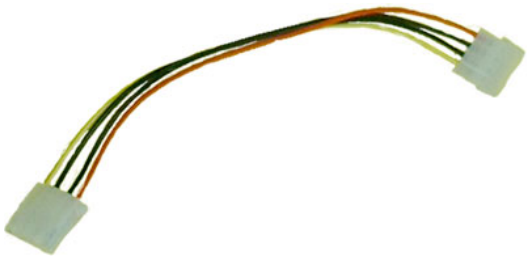
Item	Part Name	Part Number	Description	Qty	FRU
717	Monitor Power Connection Cable	KTZ212032	Line cord for Supply from Main-Device to Sub-Devices	1	1
718	Monitor Signal Cable RGB 75E	KTZ212010	Monitor cable RGB 75E; 2m VGA/SVGA	1	1
719	PS2 Y-splitter	KTZ212440	Splits the PS2 connector for GEU4-6 (mouse and PC-keyboard)	1	1
720	Power Cable for Hard disk	KTZ212401	Power cable for Hard disk 4pin 230mm 	1	1

Table 9-14 Miscellaneous Cables

Item	Part Name	Part Number	Description	Qty	FRU
721	Power Cord Europe 230V	KTZ212317	Power Cord Europe 230V/240V	1	1
722	Power Cord Japan (Hosp.grade)	KTZ212448	Power Cord Japan Hospital Grade	1	1
723	Power Cord UK	KTZ212441	Power Cord United Kingdom 240V	1	1
724	Power Cord USA (Hosp.grade)	KTZ212402	Power Cord USA Hospital Grade	1	1

Table 9-14 Miscellaneous Cables

Item	Part Name	Part Number	Description	Qty	FRU
725	SCSI Adapter 68 Pin - 50 Pin	KTZ212075	Leads the SCSI-Signal from the PC-Board to the PC-Backpanel. Connector on PC-Side: 68pol, Connector on PC-Backpanel: MD-50P female	1	1
726	SCSI Adapter 68 Pol. -> 50 Pol.	KTZ212103	Leads the SCSI-Signal from the PC-Board to the PC-Backpanel. Connector on PC-Side: 68pol, Connector on PC-Backpanel: MD-50P female	1	1
727	USB to ICP CPU Board	KTZ207029	USB for PC-Slot, Connector on Backpanel. Cables are connected to PC-Board. Leads the USB-signals to the PC-Backpanel	1	1

Section 9-11
Optional Peripherals and Accessories

Figure 9-13 Optional Peripherals and Accessories

Table 9-15 Optional Peripherals and Accessories

Item	Part Name	Part Number	Description	Qty	FRU
801	Sony B/W Video Printer UP-895MD (CE)	KTZ211332	NTSC/PAL	1	1
802	PPP55 Connection Set	KTZ195643	Connection Set UP-895MD	1	1
803	Mitsubishi B/W Video Printer P-91E	KTZ211007	NTSC/PAL	1	1
804	Sony Digital Color Printer UP-D21MD	KTZ211357	USB-Port	1	1
805	PZP60 Connection Set	KTZ195776	Connection Set UP-D21MD	1	1
806	Sony Digital Color Printer UP-D2600S	KTZ211060	SCSI-Port	1	1
807	Mitsubishi Digital Color Printer CP770DW	KTZ211352	SCSI-Port	1	1
808	PZP50 Connection Set	KTZ195486	Connection Set UP-D2600S / CP770DW	1	1
809	Sony VCR SVO-9500 MD	KTZ211317	NTSC	1	1
810	Sony VCR SVO-9500 MDP	KTZ211318	PAL	1	1
811	PRR50 Connection Set	KTZ195492	Connection Set for VCR without remote control	1	1
812	HP Line Printer HPdeskjet 990cxi	KTZ211102	USB-Port	1	1
813	PZP55 Connection Set	KTZ195749	Connection Set HPdeskjet 990cxi	1	1
814	HP Line Printer HP deskjet 995c	KTZ211107	USB-Port	1	1
815	PZP56 Connection Set	KTZ195882	Connection Set HPdeskjet 990cxi / 995c (can replace PZP55 - KTZ195749)	1	1

Section 9-9 Options and Upgrades (cont'd)

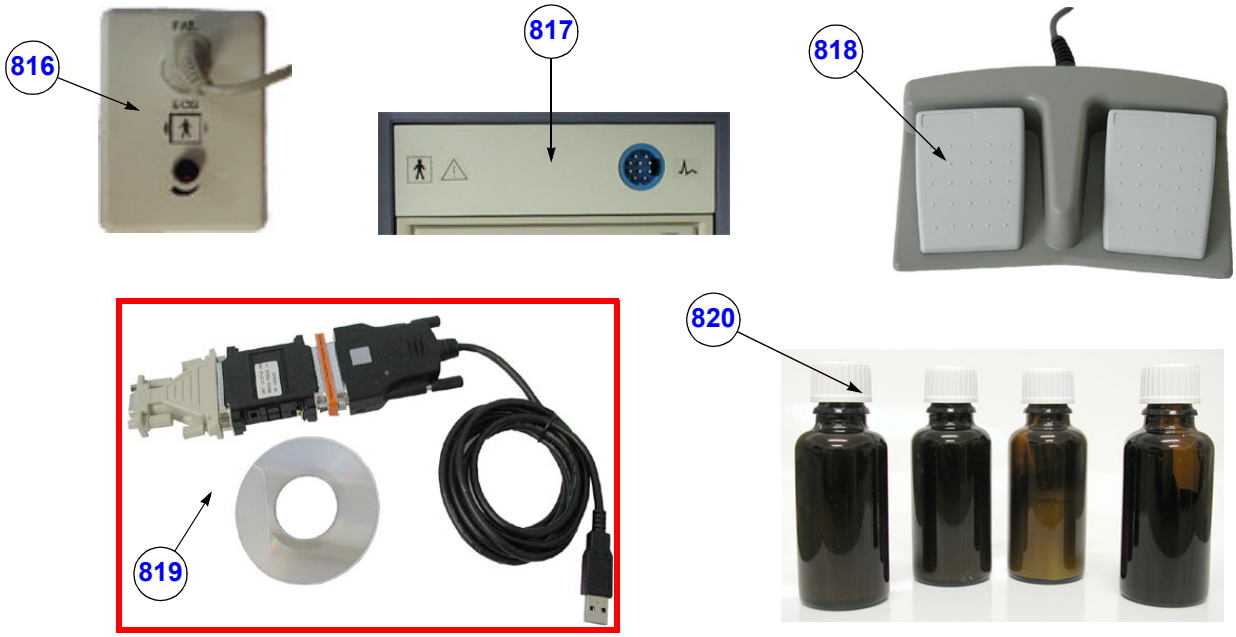


Figure 9-14 Optional Peripherals and Accessories cont´d

Table 9-16 Optional Peripherals and Accessories cont´d

Item	Part Name	Part Number	Description	Qty	FRU
816	ECG-preamplifier (MAN 3)	KTZ154258	consists of ECG-preamplifier and patient connection cable	1	1
817	ECG-preamplifier (MAN 6)	KTZ154644	consists of ECG-preamplifier and patient connection cable	1	1
818	Foot switch (MFT7)	KTZ195446	Foot switch	1	1
819	USB-RS232 Connection kit PRY	KTZ195858	Converter from USB to RS-232 Serial Port	1	1
820	Touch-up Paint Set (gray-blue)	KTZ154680	contains blue, dark-gray, bright-gray and black 4x 2cl bottels incl. brush	1	1

Table 9-17 System Manuals

Item	Part Name	Part Number	Kretz #	Description	Qty	FRU
	Voluson® 730 Service Manual	KTZ105844	105844		1	N
System User Manuals						
	Basic User Manual, Voluson® 730, English	H46601B			1	N
	Instruction Manual, Voluson® 730, English	H46611E			1	N
	Instruction Manual, Voluson® 730, German	H46611G			1	N
	Instruction Manual, Voluson® 730, Spanish	H46611S			1	N
	Instruction Manual, Voluson® 730, Russian	H46611R			1	N
	Instruction Manual, Voluson® 730, French	H46611F			1	N
	Instruction Manual, Voluson® 730, Italian	H46611Y			1	N

Section 9-12
Probes

9-12-1 2D-Probes

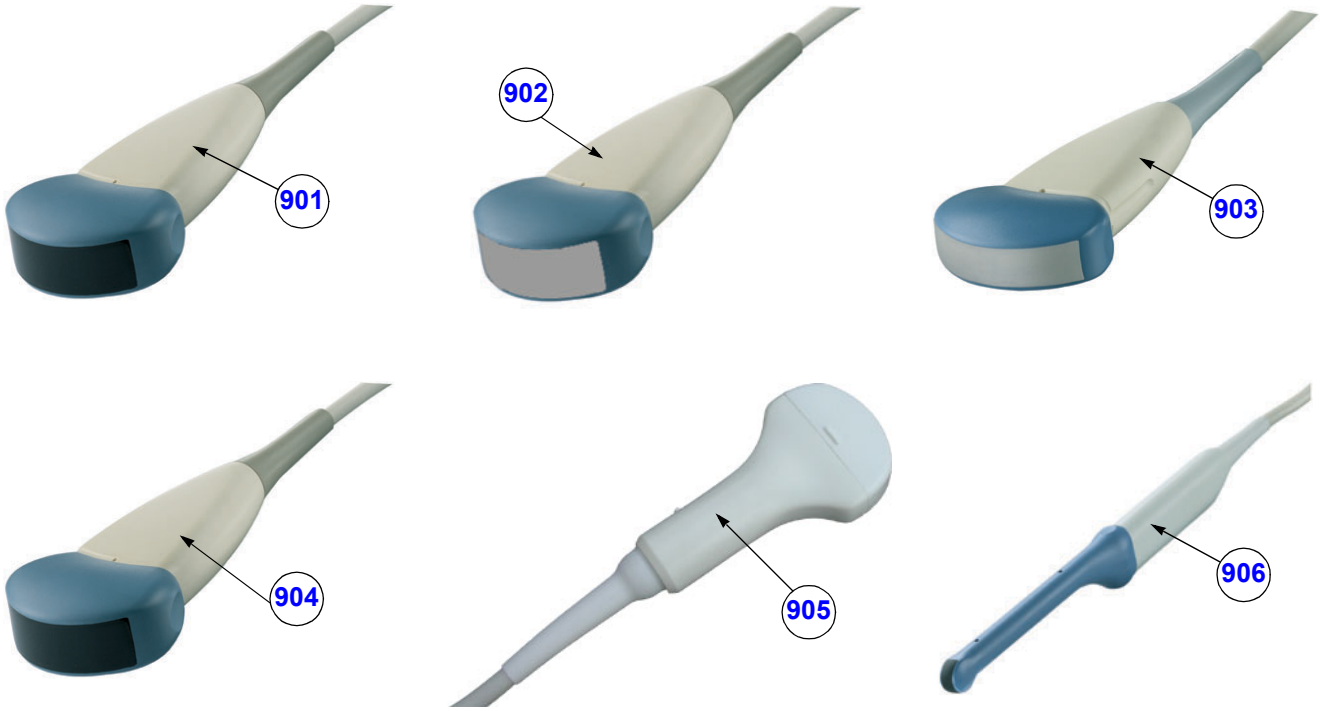


Figure 9-15 2D curved array Transducers

Table 9-18 2D curved array Transducers

Item	Part Name	Part Number	Description	Qty	FRU
901	AB2-5	KTZ195351	electronic broadband curved array transducer, frequency range of 2-5 MHz Applications: Abdominal, Obstetrics, Gynecology		1
902	AB2-5GL	KTZ195372	electronic broadband curved array transducer, frequency range of 2-5 MHz Applications: Abdominal, Obstetrics, Gynecology (with **G**ray **L**ense ; replaces AB2-5 ->KTZ195351)		1
903	AB3-8	KTZ195546	electronic broadband curved array transducer, frequency range of 3-8 MHz Applications: Abdominal, Obstetrics, Gynecology, Urology, Pediatrics		1
904	AB4-8	KTZ195354	electronic broadband curved array transducer, frequency range of 4-8 MHz Applications: Abdominal, Obstetrics, Gynecology, Pediatrics		1
905	S-ACP4-7	KTZ194840	electronic wideband sector transducer with a center frequency of 4.5 MHz Applications: Abdominal, Obstetrics, Gynecology		1
906	IC5-9	KTZ195386	electronic endocavity broadband curved array transducer, frequency range of 5-9 MHz and a field-of-view of max. 150° Applications: Obstetrics, Gynecology, Urology		1

9-12-1 2D-Probes (cont'd)

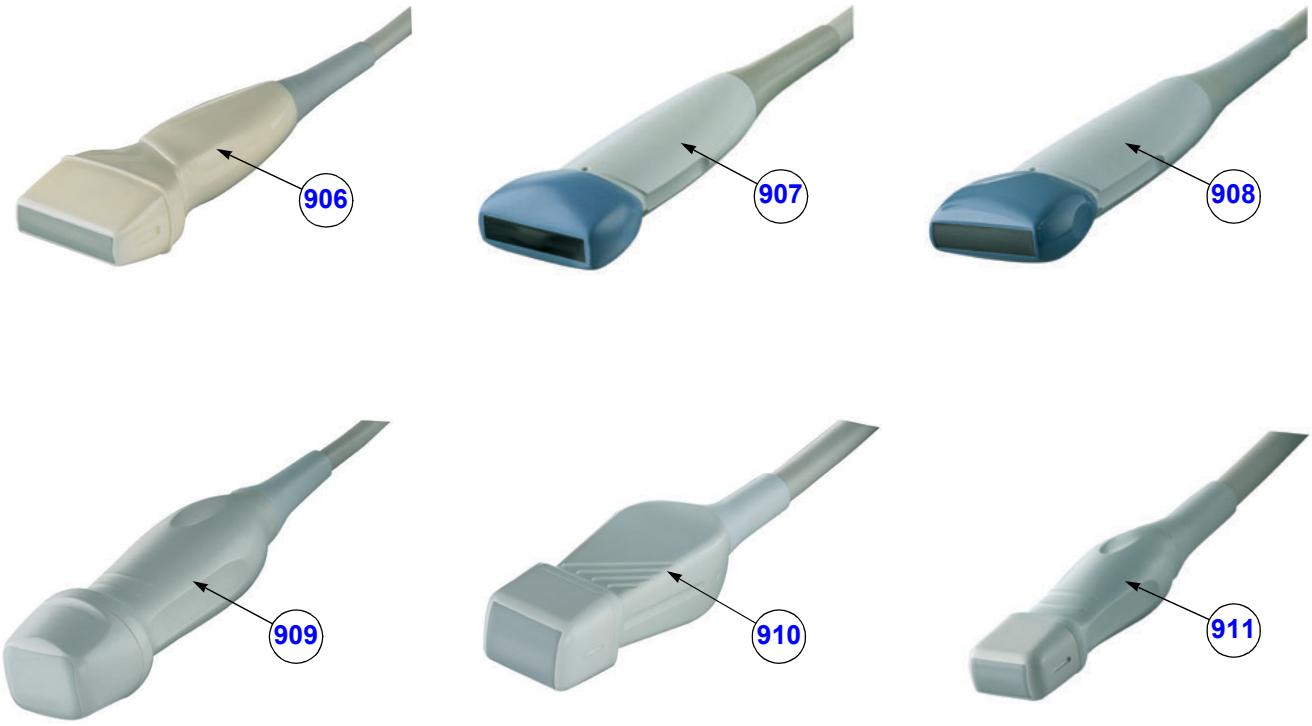


Figure 9-16 2D linear- and phased array Transducers

Table 9-19 2D linear- and phased array Transducers

Item	Part Name	Part Number	Description	Qty	FRU
906	SP4-10	KTZ195530	electronic broadband linear array transducer, frequency range of 4-10 MHz, electronically steerable Applications: Small Parts, Peripheral Vascular, Pediatrics, Orthopedics		1
907	SP6-12	KTZ195362	electronic broadband linear array transducer, frequency range of 6-12 MHz, electronically steerable Applications: Small Parts, Peripheral Vascular, Pediatrics, Orthopedics		1
908	SP10-16	KTZ195531	electronic broadband linear array transducer, frequency range of 10-16 MHz, electronically steerable Applications: Small Parts, Orthopedics		1
909	PA2-5	KTZ195507	electronic broadband phased array transducer, frequency range of 2-5 MHz Applications: Abdominal, Cardiology, Transcranial		1
910	PA4-7	KTZ195511	electronic broadband phased array transducer, frequency range of 4-7 MHz Applications: Cardiology, Pediatrics		1
911	PA6-8	KTZ195532	electronic broadband phased array transducer, frequency range of 6-8 MHz Applications: Cardiology, Pediatrics/Neonatology		1

9-12-2 Real-Time 4D Volume Probes

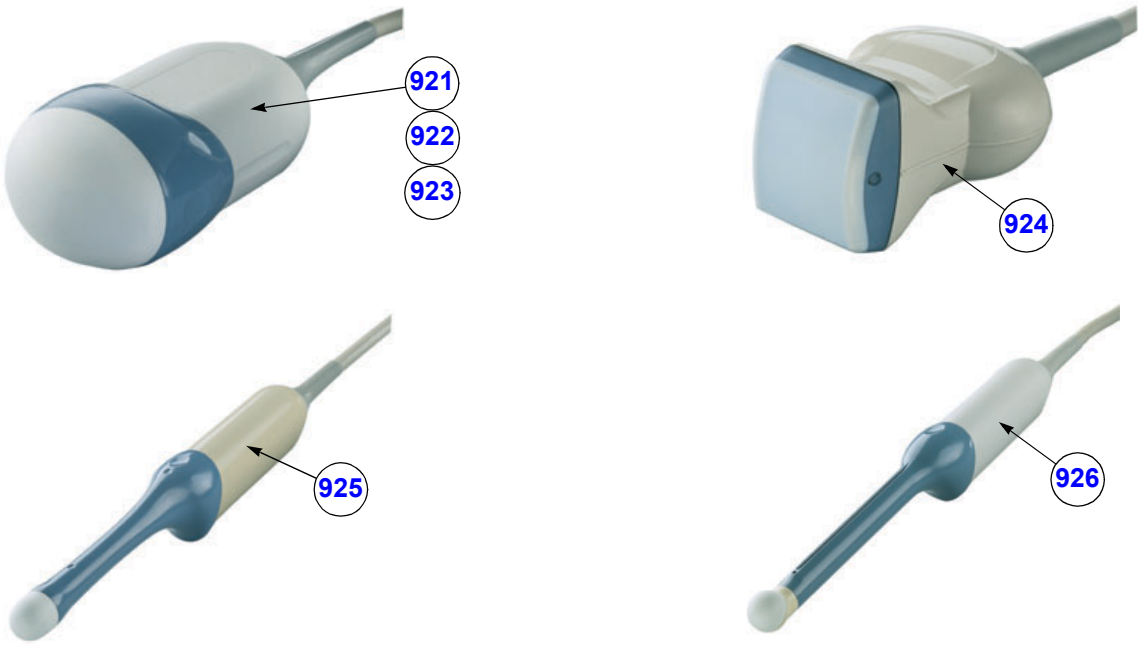


Figure 9-17 Real-Time 4D Volume Probes

Table 9-20 Real-Time 4D Volume Probes

Item	Part Name	Part Number	Description	Qty	FRU
921	RAB2-5	KTZ156736	Real-time 4D broadband electronic curved-array transducer with a frequency range of 2-5MHz. Applications: Abdominal, Obstetrics, Gynecology, Interventional Radiology		1
922	RAB4-8	KTZ156738	Real-time 4D broadband electronic curved-array transducer with a frequency range of 4-8 MHz. Applications: Abdominal, OB, Gyn, Pediatrics, Interventional Radiology		1
923	RAB4-8P	KTZ156767	(Follow-up model of RAB4-8 -> KTZ156738) Real-time 4D broadband electronic curved-array transducer with a frequency range of 4-8 MHz. Applications: Abdominal, OB, Gyn, Pediatrics, Interventional Radiology		1
924	RSP6-12	KTZ195533	Real-time 4D broadband electronic linear array transducer with a frequency range of 6-12MHz and a scan width of 40 mm. Applications: Small Parts, Periph.Vascular, Pediatrics, Urology, Orthopedics		1
925	RIC5-9	KTZ195242	Real-time 4D endocavity broadband electronic curved array transducer with a frequency range of 5-9MHz. Applications: Gynecology/Fertility, Obstetrics, Urology		1
926	RRE6-10	KTZ195534	Real-time 4D Multi-Plane electronic broadband curved array transrectal transducer with a frequency range of 6-10 MHz. Applications: Urology, Rectal wall		1

9-12-3 CW-Pencil Probes

Figure 9-18 CW- Pencil Probes

Table 9-21 CW- Pencil Probes

Item	Part Name	Part Number	Description	Qty	FRU
931	PCW4.0	KTZ195540	single element Continuous Wave (CW) Doppler pencil probe with a nominal operating frequency of 4.0 MHz (no B-image) Applications: Cardiology, Pediatrics		1
932	SCW2.0	KTZ195538	single element Continuous Wave (CW) Doppler pencil probe with a nominal operating frequency of 2.0 MHz (no B-image) Applications: Cardiology (suprasternal)		1

9-12-4 Live 3D Probes

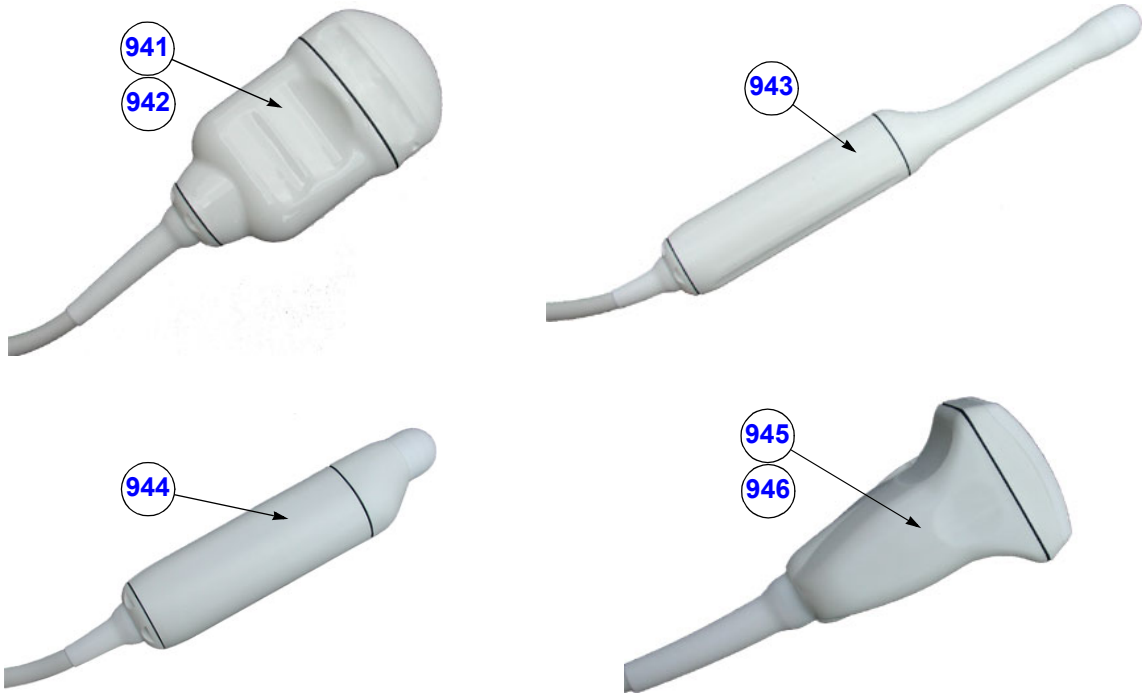


Figure 9-19 Live 3D Probes

Table 9-22 Live 3D Probes

Item	Part Name	Part Number	Description	Qty	FRU
941	S-VAW3-5	KTZ156606	3D wideband electronic sector-transducer, center frequency: 3.5 MHz Applications: Abdominal, Obstetrics and Gynecology		1
942	S-VAW4-7	KTZ156685	3D wideband electronic sector-transducer, center frequency: 4.5 MHz Applications: Abdominal, Obstetrics and Gynecology		1
943	S-VDW5-8B	KTZ156664	3D endocavity electronic sector transducer, center frequency: 6.5 MHz Applications: Obstetrics, Gynecology, Urology		1
944	S-VNA5-8B	KTZ156662	3D neonatal electronic wideband transducer, center frequency: 6.5 MHz Applications: Neonatal Cephalic, Pediatrics, Small parts		1
945	S-VNW5-10	KTZ156695	3D broadband electronic linear array transducer with a frequency range from 5-10 MHz and a scan width of 40 mm. Applications: Small parts, Peripheral Vascular, Pediatrics, Musculoskeletal		1
946	S-VNW6-12	KTZ195339	3D broadband electronic linear array transducer with a frequency of 8.0MHz and a scan width of 40 mm. Applications: Small parts, Peripheral Vascular, Pediatrics, Musculoskeletal		1

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Chapter 10
Periodic Maintenance

Section 10-1
Overview

10-1-1 Purpose of Chapter 10

This chapter describes Periodic Maintenance (PM) on the scanner and its peripherals. These PM procedures are intended to maintain the quality of the ultrasound systems performance. Read this chapter completely and familiarize yourself with the procedures before starting a PM.

Table 10-1 Contents in Chapter 10

Section	Description	Page Number
10-1	Overview	10-1
10-2	Why do Periodic Maintenance	10-2
10-3	Periodic Maintenance Schedule	10-2
10-4	Tools Required	10-5
10-5	System Periodic Maintenance	10-6
10-6	Using a Phantom	10-11
10-7	Electrical Safety Tests	10-11
10-8	When There's Too Much Leakage Current...	10-24
	PM INSPECTION CERTIFICATE	10-25

CAUTION **Practice good ESD prevention. Wear an anti–static strap when handling electronic parts and even when disconnecting/connecting cables.**

DANGER **THERE ARE SEVERAL PLACES ON THE BACKPLANE, THE AC DISTRIBUTION, AND DC DISTRIBUTION THAT ARE DANGEROUS. BE SURE TO DISCONNECT THE SYSTEM POWER PLUG AND SWITCH OFF THE MAIN CIRCUIT BREAKER (F1) BEFORE YOU REMOVE ANY PARTS. BE CAUTIOUS WHENEVER POWER IS STILL ON AND COVERS ARE REMOVED.**

CAUTION **Do not pull out or insert circuit boards while power is ON.**

CAUTION **Do not operate this unit unless all board covers and frame panels are securely in place. System performance and cooling require this.**

Section 10-2
Why do Periodic Maintenance

10-2-1 Keeping Records

It is good business practice that ultrasound facilities maintain records of periodic and corrective maintenance. The Ultrasound Periodic Maintenance Inspection Certificate provides the customer with documentation that the ultrasound scanner is maintained on a periodic basis.

A copy of the Ultrasound Periodic Maintenance Inspection Certificate should be kept in the same room or near the scanner.

10-2-2 Quality Assurance

In order to gain accreditation from organizations such as the American College of Radiology (USA), it is the customer's responsibility to have a quality assurance program in place for each scanner. The program must be directed by a medical physicists, the supervising radiologist/physician or appropriate designer.

Routine quality control testing must occur regularly. The same tests are performed during each period so that changes can be monitored over time and effective corrective action can be taken.

Testing results, corrective action and the effects of corrective action must be documented and maintained on the site.

Your GE service representative can help you with establishing, performing and maintaining records for a quality assurance program.

Section 10-3
Periodic Maintenance Schedule

10-3-1 How often should PMs be performed?

The Periodic Maintenance Schedule specifies how often your Voluson® 730 should be serviced and what items need attention. It is the customer's responsibility to ensure the Voluson® 730 periodic maintenance is performed as scheduled in order to retain its high level of safety, dependability and performance.

Your GEService Representative knows your Voluson® 730 best and can provide competent, efficient service. Please contact us for further information and to schedule GE Medical SystemsUltrasound to perform this service for you.

The services and intervals shown in the maintenance schedule assumes that you use your Voluson® 730 for an average patient load (10-12 per day) and not use it as a primary mobile unit which is transported between diagnostic facilities.

If conditions exist which exceed typical usage and patient load, then it is recommended to increase the periodic maintenance frequencies.

Abbreviations used in the Periodic Maintenance Schedule Table 10-2:

- D = Daily
- W = Weekly
- M = Monthly
- A = Annually

Table 10-2 Periodic Maintenance Schedule

Item	Service at Indicated Time	D	W	M	A	Notes
Air Filter Grid	Clean the air filter grid with vacuum cleaner from outside (right side of the system front view).			•		more frequently depending on your environment
Air Filter Grid	Remove back panel and board chassis and clean the housing from inside. (vacuum cleaner and soft brush)				•	more frequently depending on your environment
AC Mains Cable	Inspect AC Mains Cable			•		Mobile Unit Check Weekly
Cables and Connectors	Remove the Back Panel and check if all cables are well seated and if there is no mechanical damage visible; Check if they are fixed and well seated at the correct position.				•	also after corrective maintenance
User Interface	Clean alphanumerical keyboard, Functional keys, Digital potentiometers, TGC-Shift potentiometers. (vacuum cleaner, lukewarm soap water on a soft, damp cloth)		•			Be careful not to get the cloth too wet so that moisture does not enter the loudspeakers, TGC-Slider, or other keys!
Monitor and Touch Panel	Clean Top surface, Monitor, Touch Panel and Probe holder with a fluid detergent in warm water on a soft, damp cloth.		•			Be careful not to get the cloth too wet so that moisture does not enter the entire system.
Mechanical parts	Clean and inspect the mechanical function of wheels, casters, brakes and swivel locks as well as side door, foot rest, front and rear handle, and monitor holder. Remove Dust and Coupling gel.			•		Mobile Unit Check Daily
Control Panel movement	Check Turn mechanism				•	Mobile Unit Check Daily
Trackball Check	Check proper operation (Cursor movement X, Y direction)	•				If failure occurs go to trackball cleaning
Trackball Cleaning	Remove top trackball cover; open the trackball housing and take out the trackball. Clean the X, Y axes of the trackball (soft tissue and screw driver shaft)				•	Please record it in the systems setup maintenance report
Disk Drives (Sonoview Data Backup)	Save Image filing (Sonoview) Import and Export data capability (MO-, CD-RW Drive)		•	•*		* save the image filing data monthly or weekly on CD depending on the numbers of examinations
Safe Probe Operation	Clean probes and probe cables and check acoustic lens housing (cracks) and probe cables. In case of mechanical damage, don't use them! **Danger:** Safety risk for operator and patient.	•*				* or before each use
Probe Air bubbles	To detect air bubbles in filling liquid, shake the probe carefully and check abnormal noise.			•		
Probe connectors	Remove dust/dirt of all probe connectors. Clean with vacuum cleaner if dust is visible.			•		
Console Leakage Current Checks					•	Also after corrective maintenance or as required by your facilities QA program.

Table 10-2 Periodic Maintenance Schedule

Item	Service at Indicated Time	D	W	M	A	Notes
Peripheral Leakage Current Checks					•	Also after corrective maintenance or as required by your facilities QA program.
Surface Probe Leakage Current Checks					•	Also after corrective maintenance or as required by your facilities QA program.
Endocavity Probe Leakage Current Checks						**Twice Annually**
Measurement Accuracy Checks					•	Also after corrective maintenance or as required by your facilities QA program.
Probe/Phantom Checks	Check axial and lateral resolution (see Basic User Manual Technical specifications). Check Gain and TGC changes, vary the focus and check reaction on screen.				•	Also after corrective maintenance or as required by your facilities QA program.
Functional Checks of all probes Section 10-5-2 on page 10-7					•	Also after corrective maintenance or as required by your facilities QA program.

Section 10-4
Tools Required

10-4-1 Special Tools, Supplies and Equipment

10-4-1-1 Specific Requirements for Periodic Maintenance

see Chapter 7

Table 10-3 Overview of Requirements for Periodic Maintenance

Tool	Part Number	Comments
Digital Volt Meter (DVM)		minimum 5% accuracy, 3.5 digit and 200 Ohm range required
Anti Static Kit	46–194427P231 46–194427P279 46–194427P369 46–194427P373 46–194427P370	Kit includes anti–static mat, wrist strap and cables for 200 to 240 V system 3M #2204 Large adjustable wrist strap 3M #2214 Small adjustable wrist strap 3M #3051 conductive ground cord
Anti Static Vacuum Cleaner	46–194427P278 46–194427P279	120V 230V
Safety Analyzer	46–285652G1	DALE 600 KIT (or equivalent) for electrical tests
SVHS VCR Cassette	E7010GG E7010GF	60 minute 120 minute
SVHS VCR Head Cleaner		See VCR user manual for requirements
3.5” MOD MEDIA	E8381AA E8381AB KTZ207077	blank 128 M disk blank 230 M disk blank 1.3 GB MO-disk
3.5” MOD Media Cleaner	2117811	cleans the diskettes
3.5” MOD Head Cleaner Kit	2148392	cleans the drive heads
QIQ Phantom	E8370RB	RMI Grayscale Target Model 403GS
CD-RW Media		(minimum quad speed)
B/W Printer Cleaning Sheet		See printer user manual for requirements
Color Printer Cleaning Sheet		See printer user manual for requirements
Disposable Gloves		
Screwdriver PH0		
Screwdriver PH1		
Screwdriver PH2		

Section 10-5
System Periodic Maintenance

10-5-1 Preliminary Checks

The preliminary checks take about 15 minutes to perform. Refer to the system user documentation whenever necessary.

Table 10-4 System Preliminary Checks

Step	Item	Description
1	Ask & Listen	Ask the customer if they have any problems or questions about the equipment.
2	Paperwork	Fill in the top of the Periodic Maintenance (PM) Inspection Certificate. Note all probes and system options.
3	Power up	Turn the system power on and verify that all fans and peripherals turn on. Watch the displays during power up to verify that no warning or error messages are displayed.
4	Probes	Verify that the system properly recognizes all probes.
5	Displays	Verify proper display on the monitor and Touch Panel.
6	Presets	Backup all customer presets on an MO-disk.

10-5-2 Functional Checks (See Also Chapter 4)

The functional checks take about 60 minutes to perform. Refer to the system user documentation whenever necessary.

10-5-2-1 System Checks

Table 10-5 System Functional Checks

Step	Item	Description
1	B-Mode	Verify basic B-Mode (2D) operation. Check the basic system controls that affect this mode of operation.
2	M-Mode	Verify basic M-Mode operation. Check the basic system controls that affect this mode of operation.
3	C-Mode	Verify basic C-Mode (Color Flow Mode) operation. Check the basic system controls that affect this mode of operation.
4	PD-Mode	Verify basic PD-Mode (Power Doppler Mode) operation. Check the basic system controls that affect this mode of operation.
5	Doppler Modes	Verify basic Doppler Mode operation (PW and CW if available). Check the basic system controls that affect this mode of operation.
6	3D-Mode	Verify basic 3D-Mode operation. Check the basic system controls that affect this mode of operation.
7	*Applicable Software Options	Verify the basic operation of all optional modes such as Real Time 4D, RT_4D Biopsy, VOCAL, Harmonic Imaging, Sonoview, CRI (Compound Resolution Imaging), TD (Tissue Doppler), VCI (Volume Contrast Imaging),... etc. Check the basic system controls that affect each options operation.
8	Keyboard Test	Perform the Keyboard Test Procedure to verify that all keyboard controls are OK.
9	Monitor	Verify basic Monitor display functions.
10	Touch Panel	Verify basic Touch Panel display functions.
11	Measurements	Scan a gray scale phantom and use the measurement controls to verify distance and area calculation accuracy. Refer to theBasic User Manual, Chapter 13, for measurement accuracy specifications.

*NOTE: * Some software may be considered standard depending upon system model configuration.*

10-5-2-2 Peripheral/Option Checks

If any peripherals or options are not part of the system configuration, the check can be omitted. Refer to Table 3-9, “Approved Peripherals,” on page 30for a list of approved peripherals.

Table 10-6 Approved Peripheral/Hardware Option Functional Checks

Step	Item	Description
1	VCR	Verify record/playback capabilities of the VCR. Clean heads and covers if necessary.
2	B/W Printer	Verify hardcopy output of the B/W video page printer. Clean heads and covers if necessary.
3	Color Printer	Verify hardcopy output of the Color video page printer. Clean heads and covers if necessary.
4	Line Printer	Verify hardcopy output of the Line printer. Clean heads and covers if necessary.
5	DICOM	Verify that DICOM is functioning properly. Send an image to a DICOM device.
6	Footswitch	Verify that the footswitch is functioning as programed. Clean as necessary.
7	ECG	Verify basic operation with customer.

10-5-3 Input Power

10-5-3-1 Mains Cable Inspection

Table 10-7 Mains Cable Inspection

Step	Item	Description
1	Unplug Cord	Disconnect the mains cable from the wall and system.
2	Inspect	Inspect it and its connectors for damage of any kind.
3	Verify	Verify that the LINE, NEUTRAL and GROUND wires are properly attached to the terminals, and that no strands may cause a short circuit.
4	Verify	Inlet connector retainer is functional.

10-5-4 Cleaning

10-5-4-1 General Cleaning

Table 10-8 General Cleaning

Step	Item	Description
1	Console	Use a fluid detergent in warm water on a soft, damp cloth to carefully wipe the entire system. Be careful not to get the cloth too wet so that moisture does not enter the console.
2	Probe Holder	Clean probe holders (they may need to be soaked to remove excess gel).
3	Monitor and Touch Panel	Clean Top surface, Monitor and Touch Panel with a fluid detergent in warm water on a soft, damp cloth.

10-5-5 Physical Inspection

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Table 10-9 Physical Checks

Step	Item	Description
1	Labeling	Verify that all system labeling is present and in readable condition.
2	Scratches & Dents	Inspect the console for dents, scratches or cracks.
3	Control Panel	Inspect keyboard and control panel. Note any damaged or missing items.
4	Control Panel Movement	Verify ease of control panel (Operator I/O Panel) movement in acceptable direction. Ensure that it latches in position as required.
5	Wheels & Brakes	Check all wheels and casters for wear and verify operation of foot brake, to stop the unit from moving, and release mechanism. Check all wheel locks for proper operation.
6	Cables & Connectors	Check all internal cable harnesses and connectors for wear and secure connector seating. Pay special attention to footswitch assembly and probe strain or bend reliefs.
7	Shielding & Covers	Check to ensure that all EMI shielding, internal covers, air flow panels and screws are in place. Missing covers and hardware could causeEMI/RFI problems while scanning.
8	External I/O	Check all connectors for damage and verify that the labeling is good.
9	Op Panel Lights	Check for proper operation of all operator panel key illuminations (flash once during system start-up).
10	Monitor Light	Check for proper operation of any monitor lights if available.
11	External Microphone	Check for proper operation of any external microphones by recording an audio test if available.

⚠ **NOTICE** There is no microphone built in and released for Voluson® 730.

10-5-6 Optional Diagnostic Checks

To complete the PM checks, access the diagnostic software as described in Chapters 5 or 7. View the error logs and run desired diagnostics.

10-5-7 Probe Maintenance

10-5-7-1 Probe Related Checks

Table 10-10 Probe Related Checks

Step	Item	Description
1	Probe Holder	Clean probe holders (they may need to be soaked to remove excess gel).
2	Probes	Thoroughly check the system probe connectors and remove dust from inside the connector sockets if necessary. Visually check for bent, damaged or missing pins

10-5-7-2 Basic Probe Care

The probe user manuals provide a complete description of probe care, maintenance, cleaning and disinfection. Ensure that you are completely familiar with the proper care of GE probes.

Ultrasound probes can be easily damaged by improper handling. See the User's Manual of the respective probe for more details. Failure to follow these precautions can result in serious injury and equipment damage. Failure to properly handle or maintain a probe may also void its warranty.

Any evidence of wear indicates the probe cannot be used.

Do a visual check of the probe pins and system sockets before plugging in a probe.

10-5-7-3 Basic Probe Cleaning

Refer to the User's Manual of the respective probe for details on cleaning.

NOTE: To help protect yourself from blood borne diseases, wear approved disposable gloves. These are made of nitrile derived from vegetable starch to prevent allergic latex reactions.

NOTE: Failure to follow the prescribed cleaning or disinfection procedures will void the probe's warranty. DO NOT soak or wipe the lens with any product not listed in the User Manual. Doing so could result in irreparable damage to the probe. Follow care instructions that came with the probe.

NOTE: Disinfect a defective probe before you return it. Be sure to tag the probe as being disinfected.

Section 10-6
Using a Phantom

See the User´s Manual of the Phantom for information on using a phantom and quality assurance tests. Measurement Accuracy of the system (chapter 13.4). To get comparable results, use Multi-purpose phantom, Model 539-05 from ATS Laboratories Inc.

Section 10-7
Electrical Safety Tests

10-7-1 Safety Test Overview

The electrical safety tests in this section are based on and conform to NFPA 99 (For USA) and IEC 60601-1 Medical Equipment Safety Standards. They are intended for the electrical safety evaluation of cord-connected, electrically operated, patient care equipment. If additional information is needed, refer to the NFPA 99 (For USA) and IEC 60601-1 documents.

⚠ **WARNING** ***THE USER MUST ENSURE THAT THE SAFETY INSPECTIONS ARE PERFORMED AT LEAST EVERY 12 MONTHS ACCORDING TO THE REQUIREMENTS OF THE PATIENT SAFETY STANDARD IEC-EN 60601-1. ONLY TRAINED PERSONS ARE ALLOWED TO PERFORM THE SAFETY INSPECTIONS MENTIONED ABOVE.***

⚠ **CAUTION** **To avoid electrical shock, the unit under test must not be connected to other electrical equipment. Remove all interconnecting cables and wires. The unit under test must not be contacted by users or patients while performing these tests.**

⚠ **CAUTION** **Possible risk of infection. Do not handle soiled or contaminated probes and other components that have been in patient contact. Follow appropriate cleaning and disinfecting procedures before handling the equipment.**

Test the system, peripherals and probes for leakage current. Excessive leakage current can cause injury or death in sensitive patients. High leakage current can also indicate degradation of insulation and a potential for electrical failure. Do not use probes or equipment having excessive leakage current.

To minimize the risk that a probe may shock someone the customer should:

- Not use a probe that is cracked or damaged in any way
- Check probe leakage current:
  - * once a year on surface probes
  - * twice a year on endocavitary probes
  - * whenever probe damage is suspected

10-7-2 GEMS Leakage Current Limits

The following limits are summarized for NFPA 99 (For USA) and IEC 60601-1 Medical Equipment Safety Standards. These limits are GEMS standards and in some cases are lower than the above standards listed.

Table 10-11 Chassis Leakage Current Limits-Accessible Metal Surfaces

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral
USA	N/A	0.3 mA	0.3 mA	N/A
Other	0.1 mA	0.5 mA	0.5 mA	0.5 mA

Table 10-12 Type BF Applied Part Leakage Current Limits - Non-Conductive (Floating) Surface and Cavity Probes and ECG-preamplifier

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral	*Mains Applied
USA	0.05 mA	0.05 mA	0.05 mA	0.05 mA	N/A
Other	0.1 mA	0.5 mA	0.5 mA	0.5 mA	5.0 mA

*NOTE: *Mains Applied refers to the sink leakage test where mains (supply) voltage is applied to the part to determine the amount of current that will pass (or sink) to ground if a patient contacted mains voltage.*

The following tests are performed at the factory and should be performed at the site. These tests are: grounding continuity, chassis leakage current, probe leakage current, and ECG leakage current. All measurements are made with an electrical safety analyzer.

10-7-3 Outlet Test - Wiring Arrangement - USA & Canada

Test all outlets in the area for proper grounding and wiring arrangement by plugging in the neon outlet tester and noting the combination of lights that are illuminated. Any problems found should be reported to the hospital immediately and the receptacle should not be used.

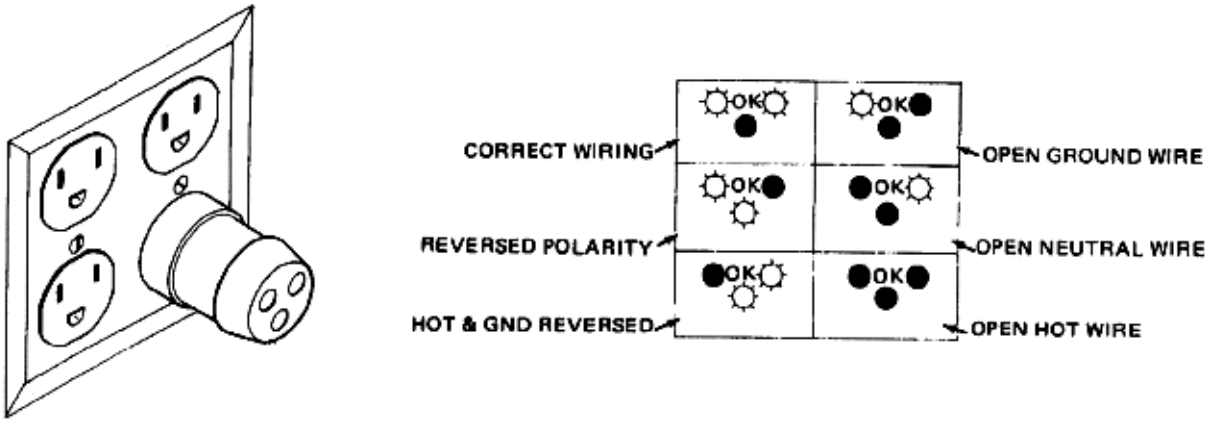

Figure 10-1 Typical Outlet Tester

NOTE: No outlet tester can detect the condition where the Neutral (grounded supply) conductor and the Grounding (protective earth) conductor are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.

10-7-4 Grounding Continuity

CAUTION **Electric Shock Hazard. The patient must not be contacted to the equipment during this test**

Measure the resistance from the third pin of the attachment plug to the exposed metal parts of the case. The ground wire resistance should be less than **0.2** ohms. Reference the procedure in the IEC 601-1.1.

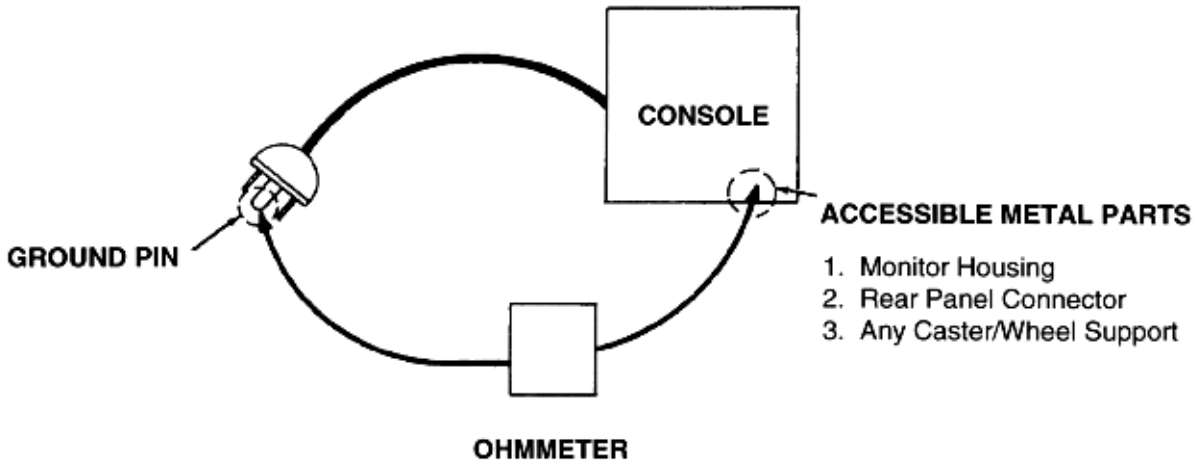

Figure 10-2 Ground Continuity Test

10-7-4-1 Meter Procedure

Follow these steps to test the ground wire resistance.

1.) Turn the Voluson® 730 unit OFF.
2.) Plug the unit into the meter, and the meter into the tested AC wall outlet.
3.) Plug the black chassis cable into the meter's “CHASSIS” connector and attach the black chassis cable clamp to an exposed metal part of the Voluson® 730 unit.
4.) Set the meter's “FUNCTION” switch to the RESISTANCE position.
5.) Set the meter's “POLARITY” switch to the OFF (center) position.
6.) Measure and record the ground wire resistance.

10-7-5 Chassis Leakage Current Test

10-7-5-1 Definition

This test measures the current that would flow in a grounded person who touched accessible metal parts of the bedside station if the ground wire should break. The test verifies the isolation of the power line from the chassis. The meter is connected from accessible metal parts of the case to ground. Measurements should be made with the unit On and Off, with the power line polarity Normal and Reversed. Record the highest reading.

CAUTION **Electric Shock Hazard. When the meter's ground switch is OPEN, don't touch the unit!**

CAUTION **Equipment damage possibility. Never switch the Polarity and the status of Neutral when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the unit may be damaged.**

10-7-5-2 Generic Procedure

The test verifies the isolation of the power line from the chassis. The testing meter is connected from accessible metal parts of the case to ground. Measurements should be made with the unit ON and OFF, with the power line polarity Normal and Reversed. Record the highest reading of current.

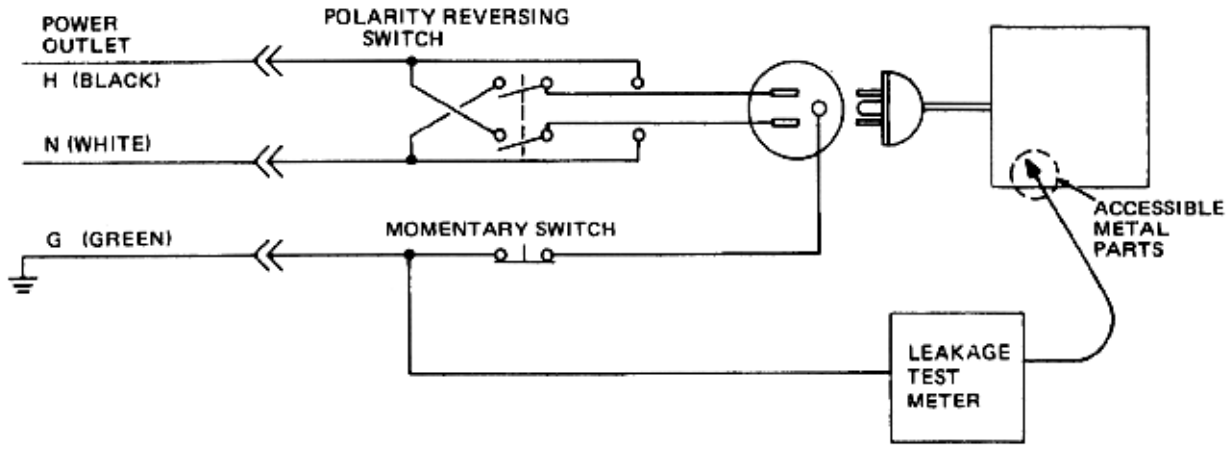

Figure 10-3 Set Up for Chassis Source Leakage Current, IEC 601-1 Clause 19 - Continuos Leakage Currents and Patient, Auxiliary Currents

When using the Microguard or a similar test instrument, its power plug may be inserted into the wall outlet and the equipment under test is plugged into the receptacle on the panel of the meter. This places the meter in the grounding conductor and the current flowing from the case to ground will be indicated in any of the current ranges. The maximum allowable limit for chassis source leakage is shown in Table 10-11.

7.) Follow the test conditions described for respective test points shown in Table 10-13.

Table 10-13 Chassis Leakage Current Test Condition

TEST	CONDITION
1	Mounting screw for probe receptacle
2	Wheel support
3	Mounting screw for CRT housing
4	Mounting screw for peripheral plugged into unit
5	Mounting screw for other peripheral powered by unit

8.) Keep a record of the results with other hard copies of PM data kept on site.

10-7-5-3 Data Sheet for Chassis Source Leakage Current

The test passes when all readings measure less than the value shown in Table 10-11. Record all data on the PM Inspection Certificate.

Table 10-14 Typical Data Sheet for Chassis Source Leakage Current

Unit Power	Tester Polarity Switch	Tester Neutral or Ground Switch	Test 1 Probe Connector	Test 2 Wheel	Test 3 CRT	Optional Test 4	Optional Test 5
Enter Name of tested peripheral here:							
ON	NORM	OPEN					
ON	NORM	CLOSED					
ON	REV	OPEN					
ON	REV	CLOSED					
OFF	NORM	OPEN					
OFF	NORM	CLOSED					
OFF	REV	OPEN					
OFF	REV	CLOSED					

10-7-6 Isolated Patient Lead (Source) Leakage–Lead to Ground

10-7-6-1 Definition

This test measures the current which would flow to ground from any of the isolated ECG leads. The meter simulates a patient who is connected to the monitoring equipment and is grounded by touching some other grounded surface. Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the ultrasound console Off and On. For each combination the operating controls, such as the lead switch, should be operated to find the worst case condition.

⚠ **CAUTION** **Equipment damage possibility. Never switch the Polarity when the unit is powered ON. Be sure to turn the unit power OFF before switching the polarity using the POLARITY switch. Otherwise, the unit may be damaged.**

10-7-6-2 Generic Procedure

Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the unit Off and On. For each combination, the operating controls such as the lead switch should be operated to find the worst case condition.

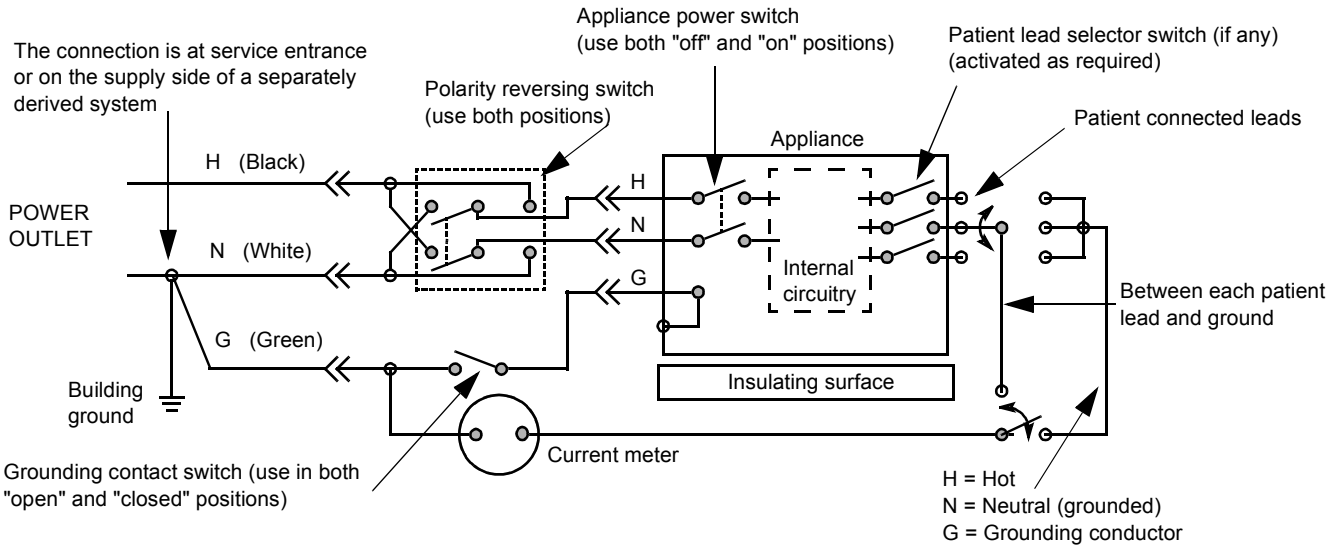
The connection is at service entrance or on the supply side of a separately derived system
Appliance power switch (use both "off" and "on" positions)
Patient lead selector switch (if any) (activated as required)
Polarity reversing switch (use both positions)
Patient connected leads
Appliance
H (Black)
POWER OUTLET
N (White)
G (Green)
H
N
G
Internal circuitry
Between each patient lead and ground
Building ground
Insulating surface
Current meter
Grounding contact switch (use in both "open" and "closed" positions)
H = Hot
N = Neutral (grounded)
G = Grounding conductor

Figure 10-4 Test Circuit for Measuring Non-Isolated Patient Leads

Table 10-15 Testing Power Conditions

ECG Power	Meter's Polarity Switch	Meter's Neutral Switch
ON	NORM	CLOSED
ON	NORM	OPEN
ON	REVERSE	CLOSED
ON	REVERSE	OPEN
OFF	NORM	CLOSED
OFF	NORM	OPEN
OFF	REVERSE	CLOSED
OFF	REVERSE	OPEN

10-7-7 Isolated Patient Lead (Source) Leakage–Lead to Lead

Reference the procedure in the IEC 60601-1. When using the Dale 600, switch the meter's function selector to the LEAD-LEAD position. Select and test each of the five ECG lead positions (except ALL) on the LEAD selector, testing each to the power condition combinations found in the table. Record the highest leakage current measured.

10-7-8 Isolated Patient Lead (Sink) Leakage-Isolation Test

Reference the procedure in the IEC 60601-1. When using the Dale 600, switch the meter's function selector to the LEAD-ISO. Select the ALL position on the lead selector. Depress the rocker switch to ISO TEST to test lead isolation.

⚠ **CAUTION** **Line voltage is applied to the ECG leads during this test. To avoid possible electric shock hazard, the system being tested must not be touched by patients, users or anyone while the ISO TEST switch is depressed.**

NOTE: It is not necessary to test each lead individually or power condition combinations as required in previous tests.

10-7-8-1 Data Sheet for ECG Leakage Current

The test passes when all readings measure less than the value shown in the table below. Record all data on the PM Inspection Certificate.

Table 10-16 Maximum Allowance Limit for ECG Leakage Current

	AC Power Source	Maximum Allowance Limit	
		GROUND OPEN	GROUND CLOSED
Patient Lead to Ground Leakage Current Test and Patient Lead to Lead Leakage Current Test	115V	10uA	10uA
	220/240V	500uA	10uA

Table 10-17 Maximum Allowance Limit for ECG Leakage Current

	AC Power Source	Maximum Allowance Limit
Patient Lead Isolation Current Test	115V	20uA
	220/240V	5mA

Table 10-18 Typical Data Sheet for ECG Leakage Current

ECG Power	Tester Polarity Switch	Tester Ground Switch	Tester Lead Selector				
			RL	RA	LA	LL	C
ON	NORM	CLOSED					
ON	REVERSE	CLOSED					
ON	NORM	OPEN					
ON	REVERSE	OPEN					
OFF	NORM	CLOSED					
OFF	REVERSE	CLOSED					
OFF	NORM	OPEN					
OFF	REVERSE	OPEN					

10-7-9 Probe Leakage Current Test

10-7-9-1 Definition

This test measures the current that would flow to ground from any of the probes through a patient who is being scanned and becomes grounded by touching some other grounded surface.

10-7-9-2 Generic Procedure

Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the unit Off and On. For each combination, the probe must be active to find the worst case condition.

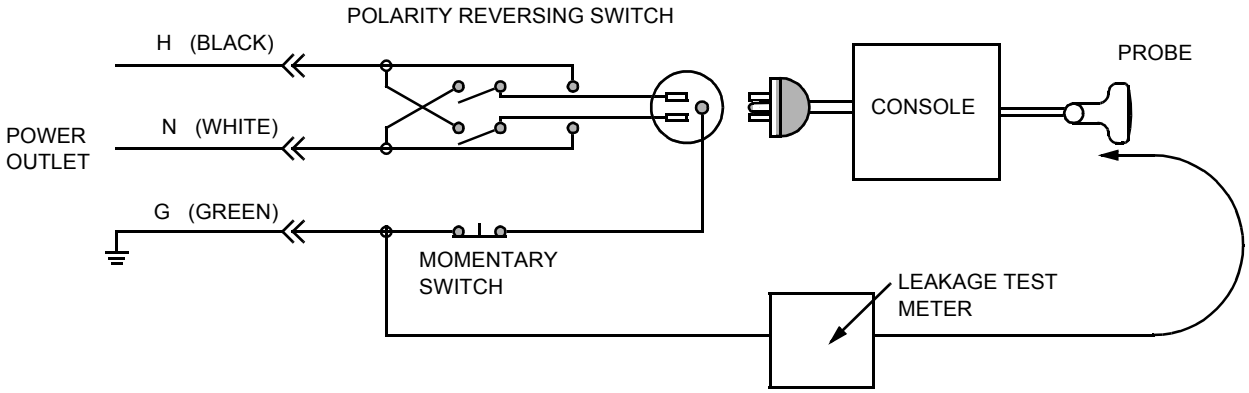

Figure 10-5 Set Up for Probe Leakage Current

NOTE: Each probe will have some amount of leakage current, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement.

10-7-9-3 No Meter Probe Adapter Procedure

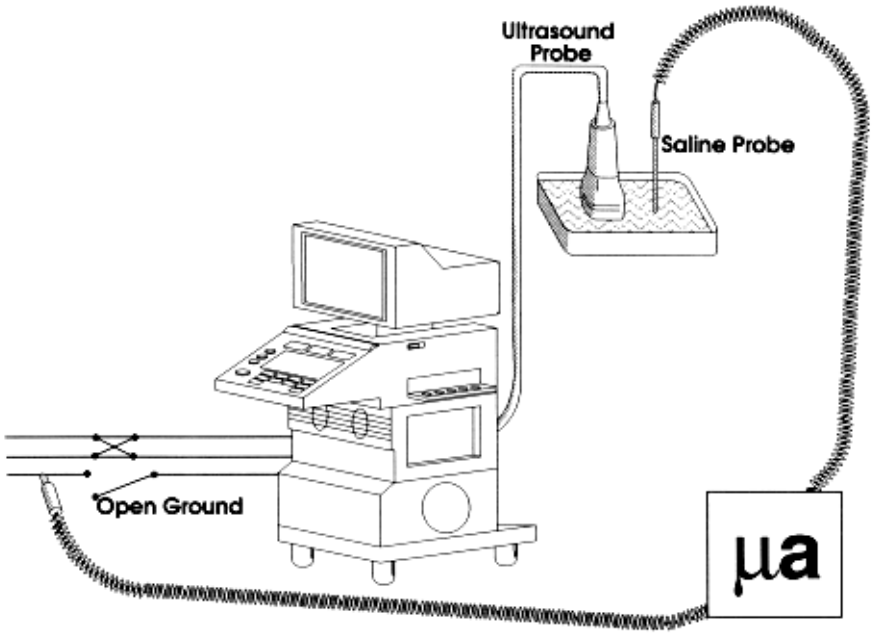

Figure 10-6 Check Without Probe Adapter

Follow these steps to test each transducer for leakage current.

1.) Turn the Voluson® 730 unit OFF.
2.) Plug the unit into the test meter, and the meter into the tested AC wall outlet.
3.) Plug the external probe into the meter's “EXTERNAL” connector.
4.) Set the meter's “FUNCTION” switch to EXTERNAL position.
5.) Connect the probe for test with the connector of the console.
6.) Add the saline probe and the imaging area of the probe into the saline bath.
7.) Have unit power ON for the first part; turn it OFF for the second half.
8.) Depress the ISO TEST rocker switch and record the highest current reading.
9.) Follow the test conditions described in Table 10-19 for every transducer.
10.)Keep a record of the results with other hand copies of PM data.

10-7-9-4 Data Sheet for Transducer Source Leakage Current

The test passes when all readings measure less than the values shown in Table 10-12. Record all data on the PM Inspection Certificate.

CAUTION **Equipment damage possibility. Never switch the Polarity and the status of Neutral when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the unit may be damaged**

Table 10-19 Typical Data Sheet For Transducer Source Leakage Current

Transducer Tested:			
Unit Power	**Tester Power Polarity Switch**	**Tester GROUND or NUETRAL Switch**	**Measurement**
ON	NORM	OPEN	
ON	NORM	CLOSED	
ON	REV	OPEN	
ON	REV	CLOSED	
OFF	NORM	OPEN	
OFF	NORM	CLOSED	
OFF	REV	OPEN	
OFF	REV	CLOSED	

Section 10-8
When There's Too Much Leakage Current...

CHASSIS FAILS

Check the ground on the power cord and plug for continuity. Ensure the ground is not broken, frayed, or intermittent. Replace any defective part.

Tighten all grounds. Ensure star washers are under all ground studs.

Inspect wiring for bad crimps, poor connections, or damage.

Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

NOTE: No outlet tester can detect the condition where the white neutral wire and the green grounding wire are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.

PROBE FAILS

Test the probe in another connector to isolate if the fault lies with the probe or the scanner.

NOTE: Each probe will have some amount of leakage, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement. The maximum allowable leakage current for body surface contact probe differs from inter-cavity probe. Be sure to enter the correct probe type in the appropriate space on the check list.

If excessive leakage current is slot dependent, inspect the system connector for bent pins, poor connections, and ground continuity.

If the problem remains with the probe, replace the probe.

PERIPHERAL FAILS

Tighten all grounds. Ensure star washers are under all ground studs.

Inspect wiring for bad crimps, poor connections, or damage.

STILL FAILS

If all else fails, begin isolation by removing the probes, external peripherals, then the on board ones, one at a time while monitoring the leakage current measurement.

NEW UNIT

If the leakage current measurement tests fail on a new unit and if situation can not be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.

ECG FAILS

Inspect cables for damage or poor connections.

PM INSPECTION CERTIFICATE

Customer Name:		System ID:	Dispatch Number / Date Performed:	Warranty/Contract/HBS
System Type		Model Number:	Serial Number:	Manufacture Date:
Probe 1:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 2:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 3:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 4:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 5:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 6:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 7:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 8:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 9:	Frequency:	Scan Format*:	Model Number:	Serial Number:

* Scan Format: Phased Array, Linear Array, Curved Array, Mechanical Array or Other

FUNCTIONAL CHECKS

Functional Check (if applicable)	OK? or N/A
B-Mode Function	
M-Mode Function	
Doppler Modes Functions	
Color Modes Functions	
3D-Mode Function	
Applicable Software Options	
Applicable Hardware Options	
Control Panel	
Monitor	
Touch Panel	
Measurement Accuracy	

PHYSICAL INSPECTION AND CLEANING

Physical Inspection and Cleaning (if applicable)	Inspect	Clean
Console		
Monitor		
Touch Panel		
Air Filter		
Probe Holders		
External I/O		
Wheels, Brakes & Swivel Locks		
Cables and Connectors		
Approved Peripherals (VCR, CD-RW, MOD, Printers)		

COMMENTS:

_____

_____

_____

_____

ELECTRICAL SAFETY

Electrical Test Performed	Max Value Allowed	Value Measured	OK?	Comments
Outlet (correct ground &wiring config.)				
System Ground Continuity				
Chassis Source Leakage Current - Probe				
Chassis Source Leakage Current - Wheel				
Chassis Source Leakage Current - CRT				
Patient Lead Source Leakage (Lead to Ground)				
Patient Lead Source Leakage (Lead to Lead)				
Patient Lead Source Leakage (Isolation)				
Peripheral 1 Leakage Current				
Peripheral 1Ground Continuity				
Peripheral 2 Leakage Current				
Peripheral 2Ground Continuity				
Peripheral 3 Leakage Current				
Peripheral 3Ground Continuity				
PROBES				
Probe Number (from previous page)	**Max Value Allowed**	**Max Value Measured**	**OK?**	**Comments**
Probe 1:				
Probe 2:				
Probe 3:				
Probe 4:				
Probe 5:				
Probe 6:				
Probe 7:				
Probe 8:				
Probe 9:				

Final Check. All system covers are in place. System scans with all probes as expected.

Accepted by: _____

INDEX

Numerics
2D-Mode Checks
Functional Checks, 4-7

A,B
Acoustic Noise Output, 3-8
Adjustment
Monitor, 6-2
Printer Settings, 3-23
Trackball, 6-5
Air Flow Control, 5-40
Application Settings (Backup)
Loading Procedure, 8-2
Archiving Images, 4-30
Audio Test, 7-18
Back End
Board Description, 5-26
CKV - Video-Card, 5-26
CPE - Back Panel I/O-Card, 5-26
CPM - PC-Motherboard card, 5-26
CPP - Power Supply Secondary Board, 5-27
CPS - DMA-Controller-Card, 5-26
Hard Disk Drive, 5-26
SBC - Single Board Computer, 5-26
BackEnd Processor
Theory, 5-24
Backup
Patient Database, 4-25
Preset Configurations, 4-25
Basic Measurements
Functional Checks, 4-18
Blockdiagram
Back End Processor, 5-24
CPS - Scan Converter Board, 5-25
Front End Processor, 5-19
Voluson 730, 5-9
Voluson 730 Basic, 5-4
Board Descriptions
Back End, 5-26
Front End, 5-21
Boot Up, 3-9, , 4-2

C
Calculation Measurements
Functional Checks, 4-21
General remarks to perform, 4-21
CD/RW-Drive
Theory, 5-34
CE Compliance, 1-10
Cine-Mode
Functional Checks, 4-17
Color Flow Modes
Functional Checks, 4-12
Connectivity
Worksheet, 3-36
Contact Information, 1-11
Control Console
Rotation, 5-38
Transport Lock, 6-4
Control Panel, 4-4
CPN-Module
Theory, 5-35
Customer Assistance, 1-11

D
Dangerous Procedure Warnings, 1-9
Dataflow Control Description, 5-10
Digital Color Printer
Installation CP770DW, 3-16
Installation UP-D21MD, 3-14
Installation UP-D2600S, 3-16
Doppler Mode Checks
Functional Checks, 4-11

E
ECG
Functional Checks, 4-31
Theory, 5-34
Electrical Requirements, 2-2
Electrical Safety, 1-8
Electrostatic Discharge Warning, 1-10
EMC, 1-10
EMI, 1-10
EMI Protection, 3-7
Error Messages, 7-20
ESD, 1-10
EUM (Electronic User Manual)
Loading Procedure, 8-3
External I/O
Theory, 5-33

F
Footswitch
Connection, 5-17
Formatting Media, 4-25

Front End
Board Descriptions, 5-21
CCM - Motor Control Board, 5-23
CPC - Control Board, 5-22
CPF - Doppler+CFM Board, 5-22
CPG - MID-Processor Board, 5-22
CPK - Motherboard of GEF-Module, 5-23
CPP - Power Supply Secondary Board, 5-23
CPR - Beamformer Board, 5-21
CPU - Probe Connector Board, 5-21
CPZ - Cover Board, 5-21
CRW (CWD) - CW-Doppler Board, 5-21
Front End Processor, 5-19
Functional Checks, 4-1
2D-Mode, 4-7
Basic Measurements, 4-18
Brakes, 4-33
Calculation Measurements, 4-21
Cine-Mode, 4-17
Color Flow Modes, 4-12
Control Panel, 4-4
Doppler Modes, 4-11
ECG Checkout, 4-31
Mechanical, 4-33
M-Mode, 4-10
MOD (Magneto-Optical Drive), 4-24
Monitor Display, 4-6
Peripherals, 4-32
Probes/Connector Usage, 4-22
Required Equipment, 4-1
Touch Panel, 4-5
Volume Modes, 4-14

G
GEF Module
Main board Chassis, 5-18
General Cleaning, 10-8

H
Hard Disk Drive, 5-26
Hardware Options, 5-17
Hazard Icons, 1-4
How to use the Auto Tester, 7-5
Human Safety, 1-7

I
Image Management
Functional Checks, 4-23
Inrush Current, 2-2
Installation
Digital Color Printer CP770DW, 3-16
Digital Color Printer UP-D21MD, 3-14
Digital Color Printer UP-D2600S, 3-16
Line Printer HP 990cxi, 3-12
Line Printer HP 995c, 3-12
Internal I/O
Theory, 5-28

L
Label Locations, 1-8
Line Printer
Installation HP 990cxi, 3-12
Installation HP 995c, 3-12
Load
Presets & Configurations (Application Settings), 4-28
Loading Procedure
Application Settings (Backup), 8-2
EUM (Electronic User Manual), 8-3

M
Main board Chassis
GEF Module, 5-18
Mechanical Checks
Control Console, 4-33
Mechanical Safety, 1-7
Minimum Cable Configuration to Boot, 7-8
M-Mode Checks
Functional Checks, 4-10
Models Covered, 1-2
MO-Drive
Functional Checks, 4-24
Theory, 5-34
Monitor, 5-32
Adjustment, 6-2
Theory, 5-32
Monitor Display
Functional Checks, 4-6

N
Network IP Address Configuration, 3-37

P
Peripherals
Functional Checks, 4-32
GEM, 5-34
Physical Dimensions, 3-8, , 5-37
Power Distribution, 5-35
Power Off, 3-10
Procedure, 4-3
Power On, 3-9, , 4-2
Power Requirements
electrical, 2-2

Power Stability Requirements, 2-3
Power-up Procedures
Voltage Settings, 3-7
Preparing the Unit for Installation, 3-6
Printer Installation manually, 3-17
Printer Remote Control Selection, 3-27
Printer Settings
Adjustment, 3-23
Probe Connector Cleaning, 10-10
Probes, 3-35
Disconnecting, 4-31
Probes/Connector Usage
Functional Checks, 4-22
Product Icons, 1-5

R
Receiving and Unpacking the Equipment, 3-4
Regulatory, 6-1
Replacement Procedures
Trackball top fixation ring, 8-8
Returning/Shipping
Probes and Repair Parts, 1-9, , 8-1

S
Safety Considerations, 1-7
Save
Presets & Configurations (Application Settings), 4-27
Screen Captures, 7-4
Service Adjustments, 6-1
Service Manual
Purpose of, 1-1
Service Page, 5-41
Shutdown Procedure, 3-10, , 4-3
Software Options, 5-15
System Components, 5-3
System Configuration, 3-28
How to change Language, 3-29
How to enter Date and Time, 3-29
How to enter Hospital Name, 3-29
System Maintenance, 10-6
System Manufacturer, 1-12

T
Theory
General, 5-2
Top Console, 5-31
Theory, 5-31
Touch Panel
Functional Checks, 4-4, , 4-5
Trackball
Adjustment, 6-5
Trackball top fixation ring
Replacement Procedure, 8-8
Transducer Connection, 3-11
Troubleshooting
CD-RW, 7-18
Error Messages, 7-20
MOD, 7-18
Monitor, 7-14
Network, 7-19
Screen Captures, 7-4
Voltage Points, 7-3
Troubleshooting Trees
Noise in Image, 7-11
Printer, 7-16
System does not Power OFF/Shutdown, 7-13
System does not Power ON/Boot up, 7-10
Trackball, 7-12
Unable to Record to VCR, 7-15

U
Unpacking the Equipment, 3-4

V
Video
Specifications, 3-34
Voltage Settings, 3-7
Voltages Points, 7-3
Volume Modes
Functional Checks, 4-14

W
Warnings and Cautions, 1-7
Weight without Monitor and Peripherals, 3-8

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